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CQ

July 1965
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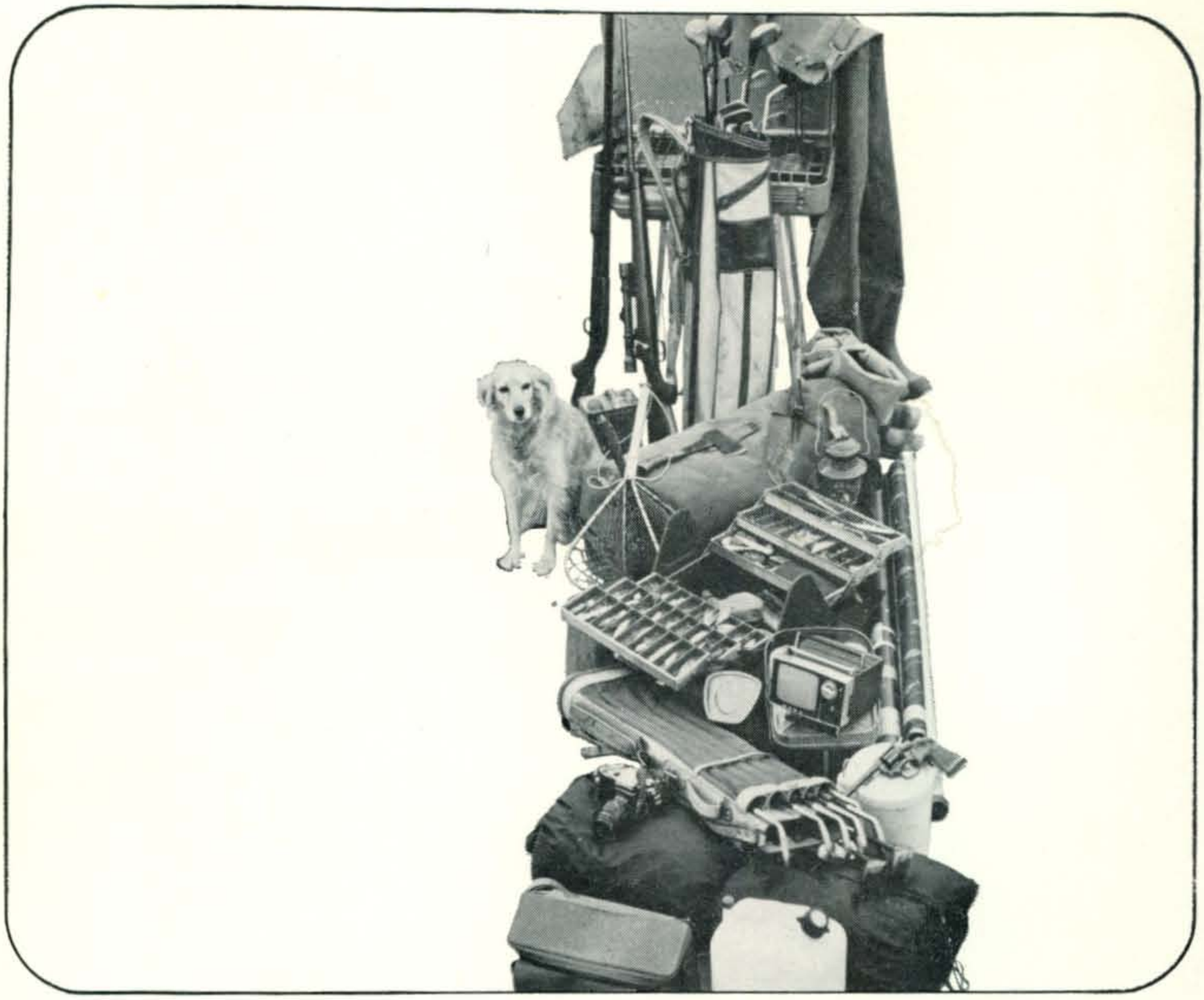
12-Hour VHF Contest Coming Up!
Don't Miss It!

The KSSB-2... page 26

On-The-Air Survey of Docket 15928 Reaction
The 4-Square-6 Mobile Antenna
CQ Tests the Galaxy V and the Waters Codax

The Radio Amateur's Journal



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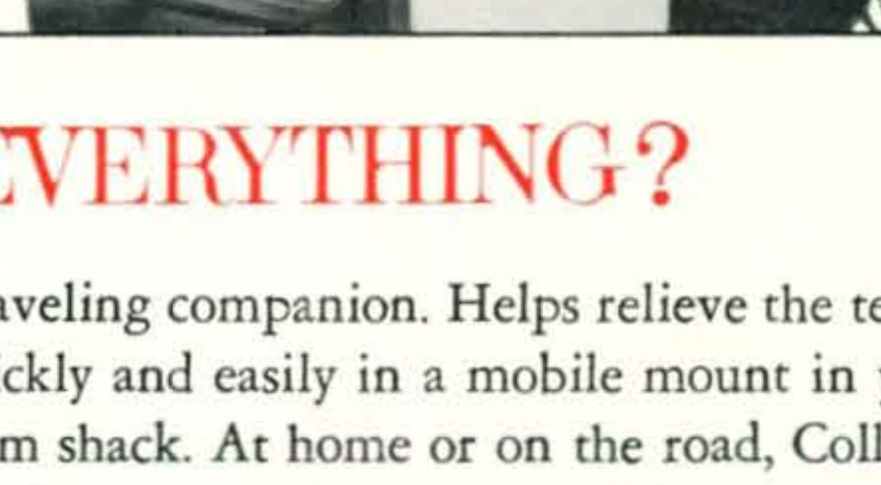

P.S. If you're driving through Iowa this summer, stop in Cedar Rapids during working hours and visit Collins. Contact the Amateur Product Office and we'll be pleased to show you around our facilities.

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For further information, check number 3, on Page 110

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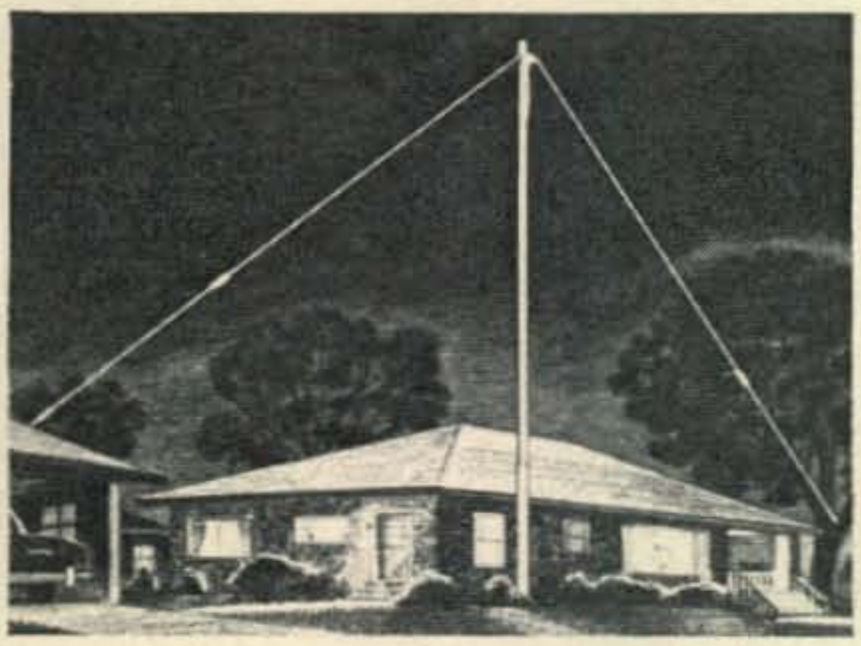

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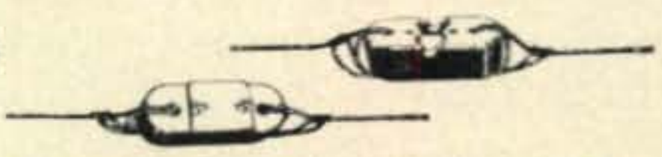

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JULY 1965 VOL. 22, No. 7

CQ The Radio Amateur's Journal

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How Ted Barger (K8ANF) turned his hobby into an exciting career in electronics . . .

Ted Barger is a licensed Electronics Technician for Smith Electronics Company. It's a good job . . . with a solid future. Let him tell you about it:

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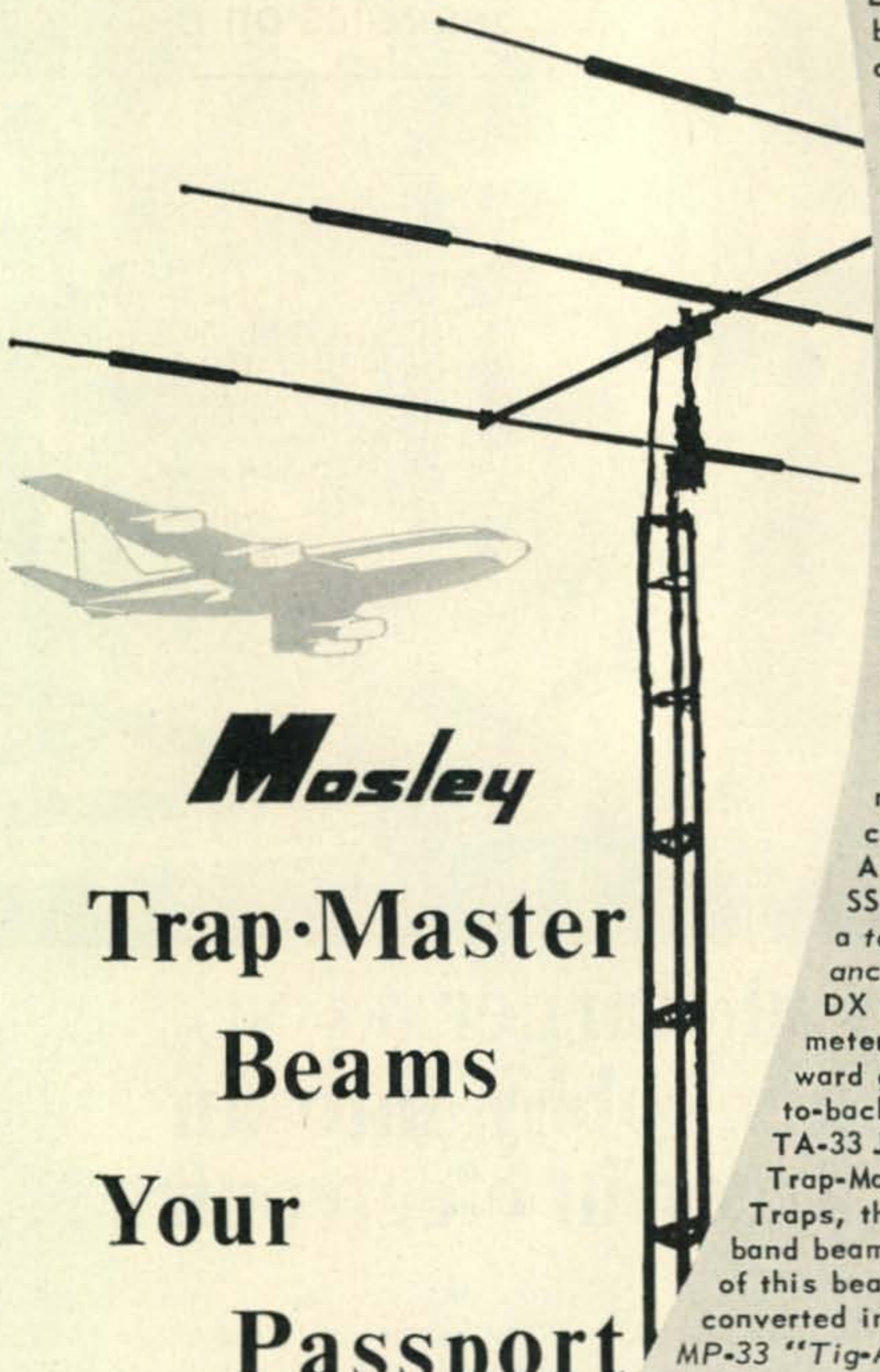

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For further information, check number 6, on page 110

ZERO BIAS

CQ 12 Hour VHF Contest—August 7. See rules on page 61.

SURPRISE! Surprise! This month I'm not going to beat the drum for or against Docket 15928! Frankly, I've got proposals and counter-proposals coming out of my ears and I'm quite sure you have, too. Response has been fantastic, and reassuring, for nearly every one of the hundreds of comments received shows evidence of calm and careful criticism of the Docket rather than the wild rage that we actually expected.

It's a good sign. Maybe the amateur public has finally realized that the way to approach a sticky situation is not to merely stand on a soapbox and shout "unfair." The correct approach is to determine *why* you think it is unfair, unnecessary or unworkable (if that's what you think), put your thoughts on paper, and get them into the hands of the folks who will make the final decision. Groaning about the darn thing on 75 isn't going to make FCC aware of your feelings—a written commentary *will*.

But even when you've fired off your masterpiece to FCC, keep one thing in mind: This is not a vote, or a popularity contest. Without a doubt, FCC will read and consider all properly submitted comments before issuing an Order or Rule Making on Docket 15928. However, they won't be simply counting pro and con votes. All that amateurs can do to alter Docket 15928 is to present strong and logical arguments why and how a certain aspect should be approached. The whole purpose of the commentary period is to allow us the opportunity to influence the judgment of the Commissioners who alone will decide upon a course of action.

With this in mind, look again at the commentary you've sent off to Washington. Do you honestly think you've presented a strong and logical argument to back up your thoughts? Have you made a case good enough to influence the judgment of a Commissioner? Have you represented yourself as a responsible citizen who knows what he is talking about, or as an enraged, indignant "kook," just sounding off?

If you discover that your letter puts you into that last category—well, there's still time to do something about it. Even if you receive this issue as late as July 1, you've still got two weeks to state your mind. Do it!

Predictions of Things to Come

On page 51 of this issue W2AEF brings you up to date on some of the latest happenings regarding OSCAR III. Seems that back on May 26, OSCAR ceased to transmit regularly its telemetry signals, which the *CQ* staff had been tracking religiously since March 9. A short brainstorming session, and a few phone calls to OSCAR afficianados turned up what we think is the reason for the silence.

The orbit of OSCAR remains at a relatively constant angle to the sun* as it whirls around the earth. The earth itself revolves about the sun, and its tilt, relative to the sun, changes with the season. The sum total of all these changes is that at three times during the year, OSCAR III's orbit will be exposed to sunlight nearly 24 hours a day. The condition lasts about 2-3 weeks, and causes the internal temperature of the package to rise to an unsafe point. Safety devices within the satellite then disable the transmitter until the temperature is again within its design tolerances.

When OSCAR first went silent, the *CQ* staff made the prediction that it would stay off for 2-3 weeks. Son-of-a-gun! We're right! Today, June 9, on orbit 1279, OSCAR appeared, right on schedule—two weeks—to the day and hour—since it first disappeared! Telemetry readings still show high internal temperatures, but they are a bit lower than on May 26.

Now let's go out on a limb with some long range predictions: On or about October 9, 1965 and again on February 9, 1966, OSCAR III will again go silent for a two week period. At about these times, the orbit will again have shifted to a position producing 24-hours of sunlight for OSCAR. Let's hope that little guy up there doesn't get tired, in the meantime, of sending "didididit didit!"

Why do we bring all this up in an editorial? Only to emphasize the fact that OSCAR III is still up there doing the job it was sent up to do. Too many fellows began to lose interest in the project after only a month or so, but the information still to be gleaned from that little gadget is tremendously interesting. If you haven't yet attempted to copy OSCAR, get on the ball and give a listen to W1AW for orbit information, and then tune up to 144.85 mc. From our own experience we must warn you that you'll soon become *completely* absorbed by this Space Communications stuff. 73, Dick, K2MGA

*Actually, the angle changes at a rate of 2.2° per day.

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Courtesy and Convention

Editor, *CQ*:

Can't wait to get home to write on decent stationery to put in my bit in favor of XE1NN/K8DIH's suggestion (in Mar, 65 LETTERS in *CQ*) that somebody publish periodically an operating frequency chart showing the newcomer, and the oldtimers, where various types of operation should be on the bands or established by past courtesy and tradition. I have scoured practically every journal for this type of information and so far the results have been almost zero. Oh yes, verbally I can get all kinds of dope which is of dubious quality and which I hesitate to accept at face value. I want to operate not only legally, but also ethically, as I'm sure do most hams. Why then is such information such a closely guarded secret? *CQ* should do Hamdom a very great service in this respect.

One more thing, if ex-WN5GQH (in Ft. Worth) ever works WA4ONZ or his 12 year old son, WA4ONY, he will have worked two hams who have a record of QSL'-ing 100%.

Cdr. J. A. Tew, WA4ONZ
1307 N. Alabama Ave.
Delano, Fla.

Editor, *CQ*:

Many thanks to you for publishing XE1NNN's letter, and congratulations to him for having the courage to write it.

I strongly endorse Mr. Wheaton's ideas.

J. Normand Hardy, WN4JFI
P.O. Box 986
Ruskin, Florida

Editor, *CQ*:

Congratulations to XE1NNN/K8DIH for saying what he did in "Letters to the Editor" in the March issue of *CQ*. By printing his "K" call sign he is enabled to say what all the VE boys have felt for a long time, but have hesitated to say for fear of creating an "international incident." I endorse his suggestion that prominent magazines such as *CQ* and *QST* should remind the amateur fraternity periodically of the rules and conventions applying to our hobby.

Donald Murphy, VE2BV
65 Summerhill Ave.
Pointe Claire, Quebec
Canada.

Customer Relations

Editor, *CQ*:

You advertise the Swan 350 transceiver and I want to let all *CQ* readers know what a wonderful experience I have had with the Swan Corporation. A short while ago I purchased a Swan 350 and found that there were a few minor adjustments to be made. I was immediately in touch with the Swan people who assumed full responsibility

◀ For further information, check number 8, on page 110

a KW ssb station

only 64½ cents per watt

The brilliant new **SB-34,** SSB 4-band transceiver serves as your receiver and exciter . . . the new matching **SB2-LA** Linear furnishes the big bang! This advanced design power combo costs you only 644.50, unquestionably the lowest cost per watt obtainable! But this is only part of the value story. **SB-34** has a **built-in power supply,** 117V AC **and 12V DC** . . . needs no separate inverter . . . connects directly to the 12V car battery when you want the added pleasure of 4-band mobile transceiver operation. **There's just no comparable value!**

SB2-LA LINEAR AMPLIFIER . . 249.50

Husky, heavy-duty, with 1KW P.E.P. input capability on 80-40-20-meters, 750 watts on 15 meters, this exceptionally compact amplifier matches SB-34 in general size and appearance. Operates perfectly with SB-34 but can boost the output of any SSB exciter to a full KW. AC power supply is built-in.

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317 ROEBLING ROAD, SOUTH SAN FRANCISCO, CALIF.

RAYTHEON **Export sales:** Raytheon Company, International Sales & Services, Lexington 73, Mass, U.S.A.

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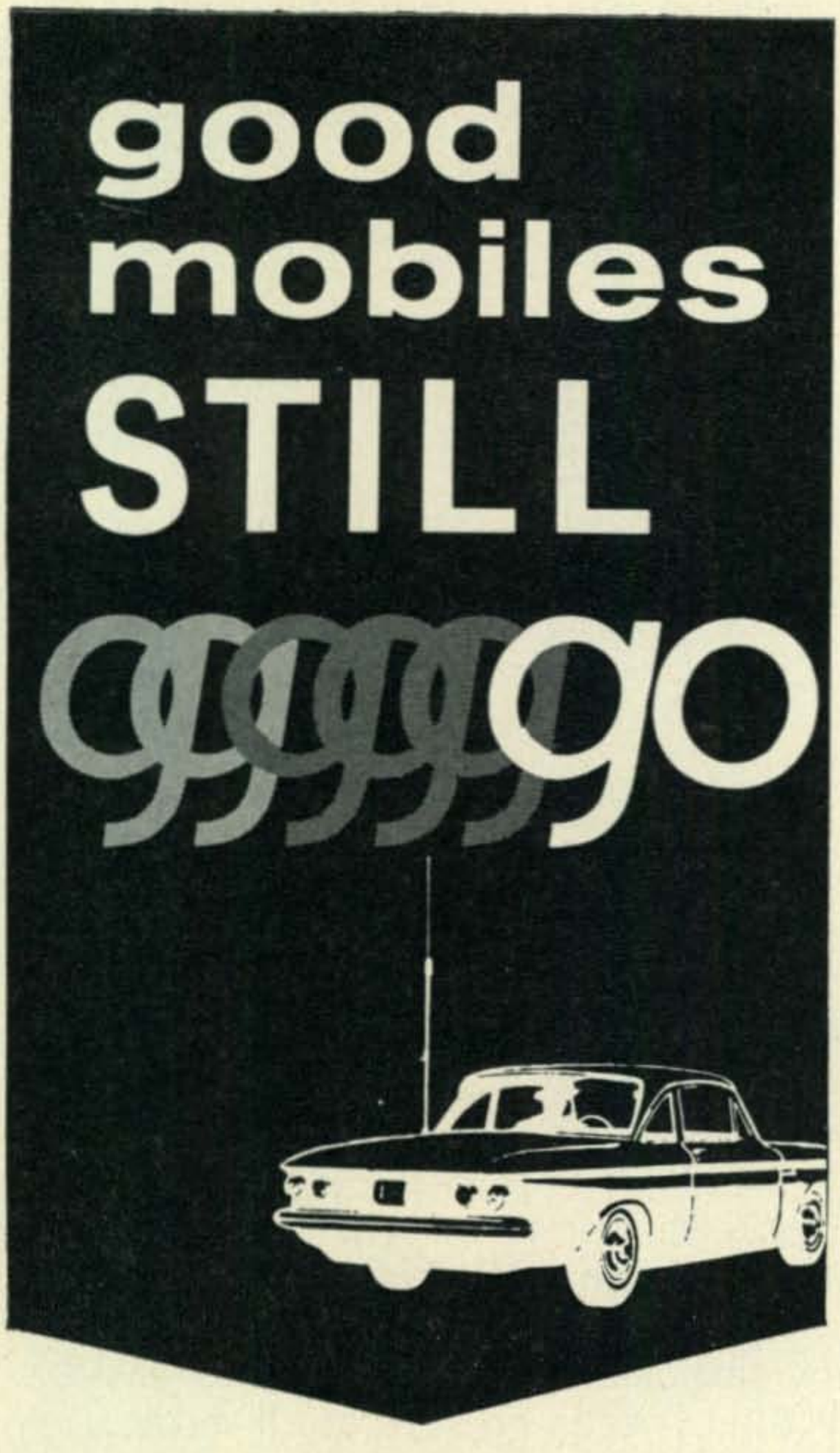


For further information, check number 10, on page 110

for all costs involved in the adjustments and shipping. My transceiver was returned to me in less than three weeks. I want to express my thanks to the Swan people whose first concern is their customers, and I feel the best way to do so is through *CQ* Magazine.

Lawrence Crone, K3AHF/2
48 Fernwood Lane
Roslyn, New York

Long Time Between QSO's

Editor, CQ:

Thought I'd write and tell you how much I enjoy reading your articles in *CQ*. I especially like the articles written on DXpeditions, since it describes a hams elation on operating from a rare spot in the world, as all of us would like to do.

I have been a General for the past two years and hold the call KP4BLH, with my station located at San Juan, Puerto Rico. I have just turned 16 and am a Junior here at Culver Military Academy.

I'd really appreciate it if some nearby amateur would contact me for an "eyeball" QSO, and if possible, a day of joint operating on his rig, since there is no station here at Culver. I only have an opportunity of operating for a month out of the year, and really miss tuning up a rig.

Thanks for any help you can give.

Cadet Sandy C. Perle, KP4BLH
Company C South Barracks
Culver Military Academy
Culver, Indiana

We Learn From Our Mistakes

Editor, CQ:

I've been a radiologist for over 30 years and a ham for almost 10 years and have been working with X-ray, radium and isotope materials for many years.

This spasm of activity came about as a result of K8IKA's article in May *CQ* "Learn from Other People's Mistakes." He reports sores in the mouth and a fever from trying to neutralize a 829B in a 2 meter rig. The 829B is rated at 40 watts, 750 volts, is a pentode and only works up to the 200 mc range. One of the first things I learned in medicine is never to make a "long distance" diagnosis, but I will speculate a little here. First, we can rule out X-rays for several reasons, the voltages were much too low as were the frequencies, even if we went to the 50th harmonic. Also, X-ray reactions do not appear for ten days to two weeks after even massive doses of radiation for treating cancer. Also, if X-ray caused the trouble inside the mouth, there would be a much more severe reaction on the face, and Lou Adler wouldn't have any whiskers or hair left when he got around to write the article, if he were still alive.

The argon tube had nothing to do with the situation. Probably he got an intercurrent infection. Possibly he had some diathermy effect by close proximity to the 829B if he was in close quarters, and warmly dressed. One of the complications of fever therapy mentioned above was the occurrance of herpes, fever blisters or "cold sores" in the mouth, sometimes so severe as to cause discontinuance of the treatment. But having failed on some occasions to produce a fever even with the sleeping bag and much more power than he was using, I doubt it. I am certain that there was no danger to life from radiation.

Harold W. Morgan, M.D., KØJTP
1312 Fourth S.W.
Mason City, Iowa

Editor, CQ:

The article by K8IKA in May 1965 *CQ* should have appeared in the April Issue as a joke but the harm has now been done by printing a completely unscientific observation apparently attempting to show a connection between u.h.f. transmitter operation and sores in the mouth in one man.

As a ham for 30 years and a physician for 20 years I have had an interest in searching for possible injurious effects from transmitters. There is to my knowledge no case of radiation injury from a low power device such as used by OM K8IKA. There have been reports of transient changes in blood counts occurring in persons working in the direct fields of high powered transmitters. There changes are apparently due to heating of the blood forming tissues (such as bone marrow) by induction.

Proceeding to u.h.f. there have been rare injuries

2000 Watts?
Two 3-400Z Triodes?
Less than $500?

See the NEW *SWAN MARK I*
Linear Amplifier

- Two 3-400Z Triodes in grounded grid circuit.
- 2000 watts PEP input.
- 1000 watts CW and tune.
- Drive requirements: 100 watts.
- Built-in changeover relay.
- Built-in 117/220VAC power supply.
- Wide range pi output.
- Dimensions: 19" x 8½" x 15½"

with the usual SWAN reliability and performance.

Price	**$425**	less tubes.
	68	Mfgr. suggested tube price.
Total	**$493**	incl. tubes.

SEE IT AT YOUR SWAN DEALER!

SWAN ELECTRONICS CORP.
Oceanside, California

For further information, check number 11, on page 110

ROHN sets the standard

for CRANK-UP TOWERS

Why settle for less than the best?

TWO CATEGORIES TO CHOOSE FROM

Standard Duty Guyed in Heights of 37 - 54 - 88 - 105 and 122 feet

Heavy Duty Self Supporting and Guyed in Heights of 37 — 54 feet (SS) 71 — 88 feet (guyed)

ROHN has these 6 IMPORTANT POINTS:

Ease of Operation—roller guides between sections assure easy, safe, friction-free raising and lowering. **Strength**—welded tubular steel sections overlap 3 feet at maximum height for extra sturdiness and strength. Unique ROHN raising procedure **raises all sections together**—uniformly with an equal section overlap at **all** heights! **Versatility**—designed to support the largest antennae with complete safety and assurance **at any height desired! Simple Installation**—install it yourself—use either flat base or special tilting base (illustrated above) depending on your needs. **Rated and Tested**—entire line engineered so you can get exactly the **right** size and properly rated tower for **your** antenna. The ROHN line of towers is **complete. Zinc Galvanized**—hot dipped galvanizing a standard—not an extra—with all ROHN towers! Prices start at less than $100.

SEND FOR ROHN TOWER HANDBOOK
—$1.25 Value
—ONLY $1.00 postpaid *(special to readers of this magazine)*. Nearest source of supply sent on request. Representatives world-wide to serve you. Write today to:

ROHN Manufacturing Co.

P. O. Box 2000 **Peoria, Illinois**

"World's Largest EXCLUSIVE Manufacturer of Towers; designers, engineers, and installers of complete communication tower systems."

For further information, check number 12, on page 110

which have been produced by microwave radar accidentally focused upon some portion of the body but the effects were those exclusively produced by heating of tissues. The power was in the megawatt range and the frequency in the *kmc* range.

Thousands of persons are exposed daily to radar waves, u.h.f. waves, TV and FM transmitters etc. without known deleterious effect. It is a matter of common knowledge that radio-frequency heating of tissues may produce beneficial effects by relieving pain and inflammation and one very popular device uses a magnetron oscillator with up to 100 watts output as a continuous wave in the u.h.f. spectrum.

It is a shame that OM K8IKA sold his rig to some other probably unsuspecting ham and the rig is not available for testing by some means other than a wet finger and an argon bulb.

In case someone else is worried about lethal radiation from his rig why not check it for radiation in an approved manner by using a film badge or a geiger counter. A Film badge is made by placing a lead washer on a piece of unexposed film in the darkroom, wrapping the film and washer in light proof paper and placing it near the suspected source with the washer side of the film nearest the infernal machine. After a suitable period of exposure the film is developed and if radiation is coming from the device being tested the washer shadow will appear as an unexposed region on the film, for most accurate results a duplicate film badge should be made at the same time and placed in a lead-shielded box (or wrapped in lead foil) for the same period of time that the test film badge is under exposure and both badges then developed in the same manner. If you do detect X-rays or another source of a penetrating ray (the AKI ray perhaps) don't sell it, patent it and make millions with a new form of energy to replace those cumbersome expensive X-ray machines, cobalt therapy machines, etc.

Finally, if you do get sores in your mouth, find out if it isn't a plain old ambiguous virus producing the very common condition of viral stomatitis, which will go away soon, with or without penicillin, with or without the final oscillating.

James H. Dooley, M.D., W6AGO
522 Thirteenth Street
Paso Robles, California

Top Honors Plaques

Editor, *CQ:*

The Arne Trossman plaque just arrived here at noon today and I was thrilled to be the recipient of this beautiful plaque, which you sent me.

It already hangs on my shack wall and is at a very prominent spot for all visitors to see.

Thanks so very much Dick for this gift plaque.

Gene DeTurck, W6YC
841 47th Avenue
San Francisco, California 94121

Editor, *CQ:*

Today I was very, very thrilled to receive the "Arne Trossman Award Plaque."

To say I was pleased would be an understatement. Knowing of your problems and disagreements with K6BX I give *CQ* much credit to follow thru even tho editors have changed and KUBX are no longer on the staff.

While pen in hand I must congratulate you on the fine job the new USA-CA Custodian is doing.

Would like to see a small box somewhere each month showing the top fifty or so county hunters totals—something like they do with DXCC.

Again thank you.

"Otts" Beyer, K8CIR
Rt. #1
Grand Haven, Mich. 49417

Editor, *CQ:*

I have just returned home after four months in Puerto Rico, and have found my Arne Trossman plaque here, for the CHC Top Honors Award.

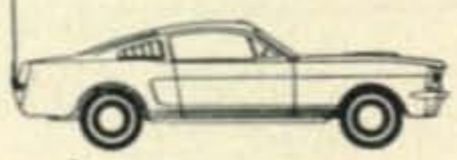
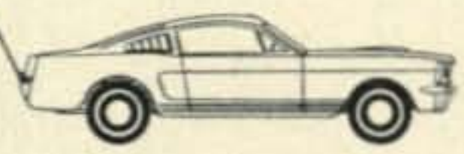
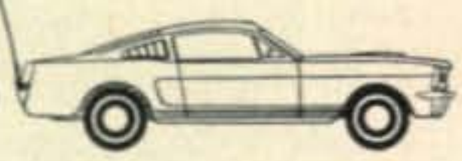
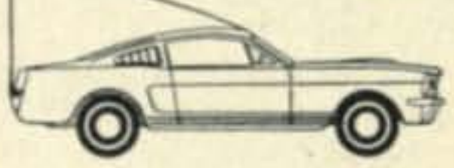
I wish to thank whomever there is responsible for going ahead with these when Arne left the employ of *CQ*.

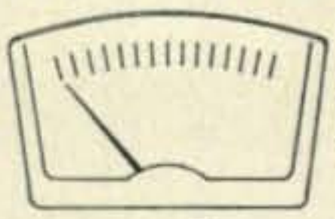
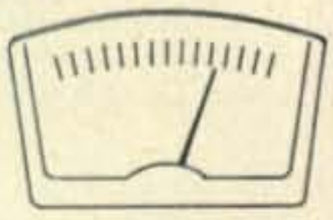
It is indeed a very beautiful award, and one which will hang on the wall of my radio room for a long time.

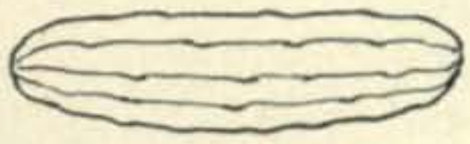
Dot Saunders, W4UF
P.O. Box 295
Englewood, Florida 33533

[*Continued on page 96*]

Waters AUTO-MATCH™

There's only ONE mobile antenna made that will stand up like this  year after year, car after car, instead of like this  or this  and never needs this  !

What's more it will add about 4 db's to your signal strength with standing wave ratios on every band that look like this  instead of this  !

Operates cool as a  too, even with a thousand PEP going that-a-way.

It's the new Waters AUTO-MATCH, but natch. Never anything like it!

Cost? $38.85 complete, ready to go on 75 meters — even less on the other bands.

WATERS MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

WATERS QUALITY PRODUCTS ARE SOLD ONLY THROUGH WATERS QUALIFIED DISTRIBUTORS

We'll see you at the San Jose Convention July 2-5th

For further information, check number 13, on page 110

MAKE YOUR OWN INEXPENSIVE
MOBILE TRANSCEIVER WITH

2 METER MINIATURE TRANSISTORIZED TRANSMITTER & RECEIVER BOARDS

Here at last are complete transistorized basic transmitter and receiver printed circuit boards tested and ready for operation as you receive them. All that is required is mounting in a suitable container, such as a mini-box, supplying —12 to —15 VDC, a microphone or an earphone.

TRANSMITTER BOARD SPECIFICATIONS:

Power Output: ¼ Watt CW minimum at 12.6 VDC.

Modulation: 90% AM MAX with single button 200 ohm carbon mike.

Power Required: 12 to 15 VDC (positive grounded) at 12.6 VDC current is approximate 190 MA with no modulation and approx. 210 MA with average modulation.

Frequency Range: 143 to 149 megacycles. Unit is supplied with a crystal giving an output frequency of 144.1 MC ± .005%. Other frequencies may be obtained on special request.

Size: 2 15/32W x 4 15/16L x 15/16H.

TRANSMITTER CIRCUIT DESCRIPTION:

A type 2N2207 is used in a 5th overtone series resonant circuit operating at ½ output frequency. A type 2N2786 is used in Class C grounded base configuration as a frequency doubler. The final amplifier is also an 2N2786 operated Class C grounded base. All stages are protected against damage due to crystal drive failure. The modulator uses 2 types 2N2431 transistors in class B push-pull for modulation. The crystals are 5th overtone ½ frequency units in HC-18U/W holders and may be easily changed. The printed circuit board base material is glass-epoxy for ruggedness.

A 3 circuit microphone jack is supplied with the transmitter board. A standard push to talk microphone is required such as an RS-38 or T-17 to activate the transmitter. An antenna change relay is supplied to switch antenna and power circuits to a receiver.

Supplied with schematic diagram and completely assembled.

Price with 144.1 MC crystal **$49.95**

Price with special crystal **$59.95**

RECEIVER BOARD SPECIFICATIONS:

Tuning: Continuous from 143 to 149 MC

Sensitivity: at 146 MC; 10 microvolts or better for a 6db signal to noise ratio

Bandwidth: Approx. ± 150 KC for 6db down

Output: 100 milliwatts at 500 ohms

Antenna: 50 ohm

Power Required: 9-13 VDC (at 12.6 VDC, 55 MA no signal, 180 MA max. signal).

Size: 2 15/32W x 3¾L x ⅝H. + tuning capacitor extension of approx. 1⅜"

RECEIVER CIRCUIT DESCRIPTION:

2N2654 used as a broad band R-F amplifier, 2N2654 R-F oscillator operating 31 MC above incoming carrier, 2N2654 mixer, 2N2654 1st IF, 262654 2nd IF, 262429 1st Audio, 2N2429 2nd Audio, 262431 Audio Driver, 2 type 2N2431 Class B push-pull output. Supplied with phone jack, on-off switch and volume control.

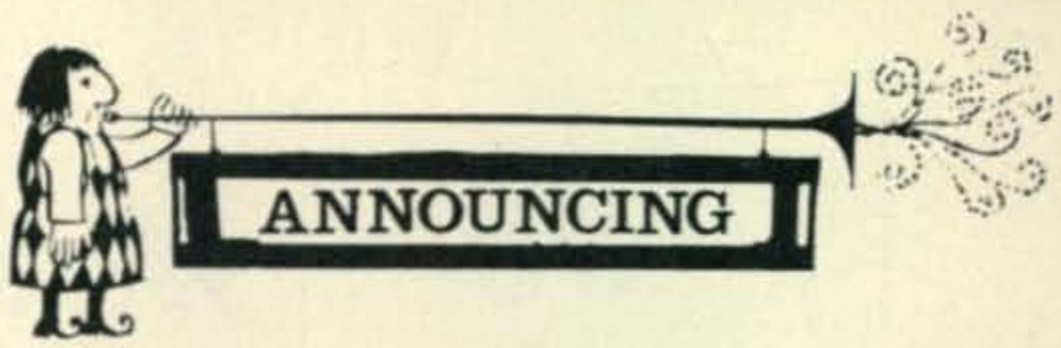
Price completely assembled and tested with schematic **$49.95**

SPECIAL COMBINATION PRICE for Receiver and Transmitter (w/144.1 mc crystal) **$95.00**

Skyway

Skyway Radio, Inc.
Greater Wilmington Airport
Box 32, Dept. M
New Castle, Delaware

For further information, check number 14, on page 110



Correction

Re: Glanzer, K. J., "Improving Power Supply Regulation," *CQ* March 1965, p. 28. The use of a 2.2 megohm 2 watt resistor as a bleeder for a 2 KV supply is not consistent with good safety practice and should be replaced by several resistors in series. A more suitable arrangement would be four 560K one or two watt units wired in series.

Oak Ridge, Tennessee

The Oak Ridge Radio Operators Club Inc. (W4SKH) will hold the annual Crossville Picnic, July 17-18, 1965, at Cumberland Mountain State Park. For full details write Oak Ridge Radio Operators Club, Box 291, Oak Ridge, Tennessee 37832.

Caspe', Wyoming

The date of the annual Wyoming Hamfest, to be held in the center of Wyoming at the Lions camp located on Casper Mountain, seven miles south of Casper will be held July 3 and 4, 1965. Check with Rudy Todan, Chairman Hamfest Committee, 1615 South Oak Street, Casper, Wyoming, for further information.

Great Valley, New York

The Southwestern New York Very High Frequency Association will hold its Seventh annual field day and picnic July 17 and 18 at Great Valley Fire Tower near Great Valley, New York, Cattaraugus County. Write to Donald M. Baker, Sec'y, Salamanca, New York for more details.

Chicago, Illinois

Six Meter Club of Chicago will hold its 8th Annual Picnic and Hamfest, Sunday, August 1, 1965, at "Picnic Grove" Frankfort, Illinois on U.S. Route 45, 1 mile north Route 30, 5 miles south of Route 6. Advance registration $1.50. At gate $2.00. Advance Regis. available from Val Hellwig, K9ZWV, 3420 South 60th Court, Cicero, Ill. 60650.

St. Stephen, N.B.

There will be a summer picnic on July 4, 1965 at the Royal Canadian Legion Grounds in St. Stephen, N.B. Canada sponsored by the St. Croix Valley International Amateur Radio Club. All visiting hams are cordially invited to attend (U.S. friends and Canadian Hams drop in and meet the boys).

Menasha, Wisconsin

The Wisconsin Nets Association will hold their annual picnic on July 11, at Jefferson Park in Menasha, Wisconsin. Registration begins at 10:00 A.M. Registration is $1.25 per single person or $2.25 for the family ticket, which includes XYL and all children. For further information contact K9AGT, Wm. Thomas, 4609 Keating Terr., Madison, Wisconsin.

Pittsburgh, Pennsylvania

The 28th Annual Hamfest of South Hills Brass Pounders and Modulators will be held in Pittsburgh on August 1, 1965, in the pavilion at St. Clair Beach, Pittsburgh, Pennsylvania. Prizes will be given. For further information write to Eugene Parise, K3MDY, 227 Baldwin Road, Pittsburgh 7, Pa.

Henderson, Kentucky

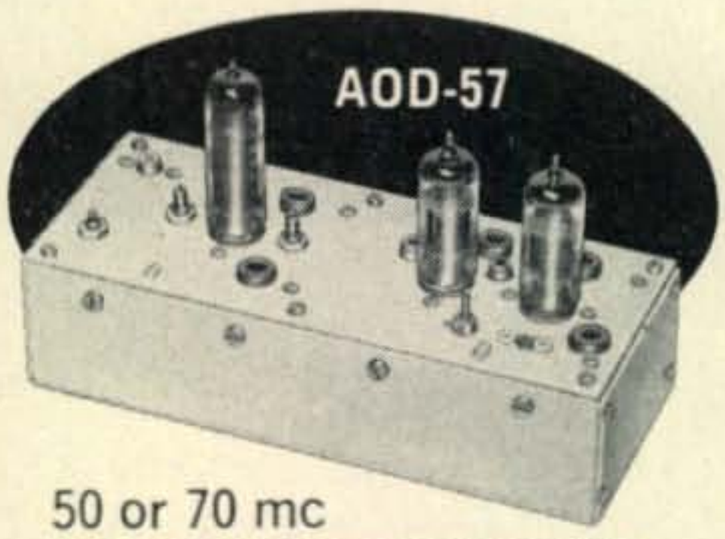
The Henderson Amateur Radio Club is planning to hold its annual hamfest at Henderson, Kentucky August 8, 1965 at the Audobon Raceway Park. There will be

[*Continued on page 93*]

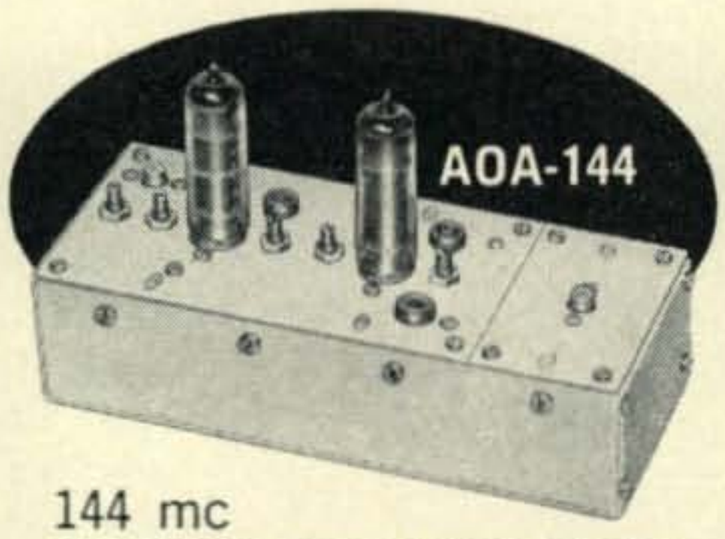
NEW FROM INTERNATIONAL

VHF/UHF UNITIZED TRANSMITTERS 50 mc—420 mc

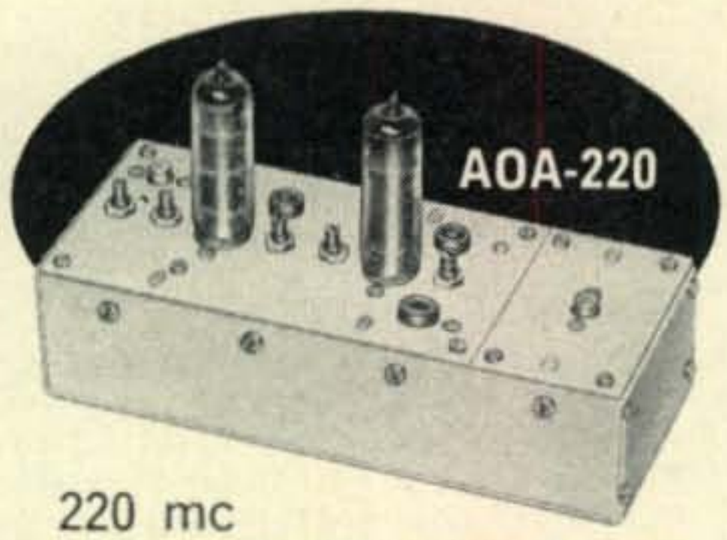
International's new unitized VHF/UHF transmitters make it extremely easy to get on the air in the 50-420 mc range with a solid signal. Start with the basic 50 or 70 mc driver. For higher frequencies add a multiplier-amplifier. All units are completely wired. Plug-in cables are used to interconnect the driver and amplifier.



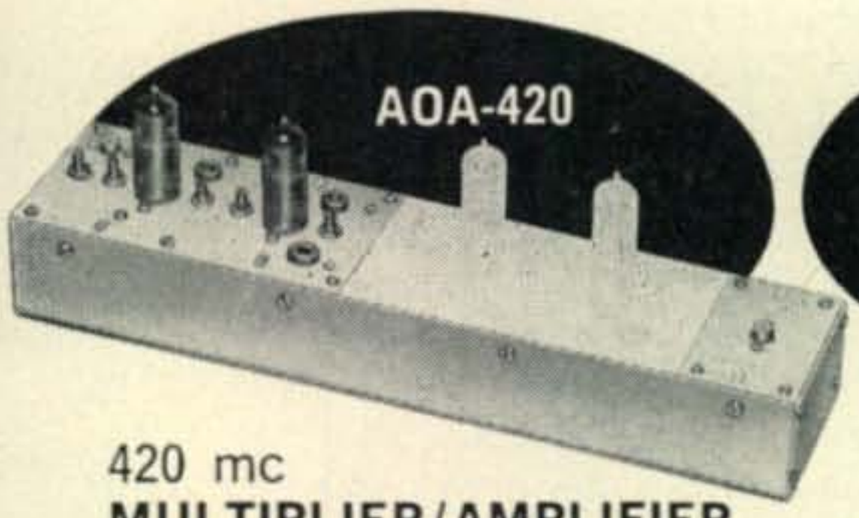
50 or 70 mc
DRIVER/TRANSMITTER
The AOD-57 completely wired with one 6360 tube, two 12BY7 tubes and crystal (specify frequency). Heater power: 6.3 volts @ 1.2 amps. Plate power: 250 vdc @ 50 ma.
AOD-57 complete.....$69.50



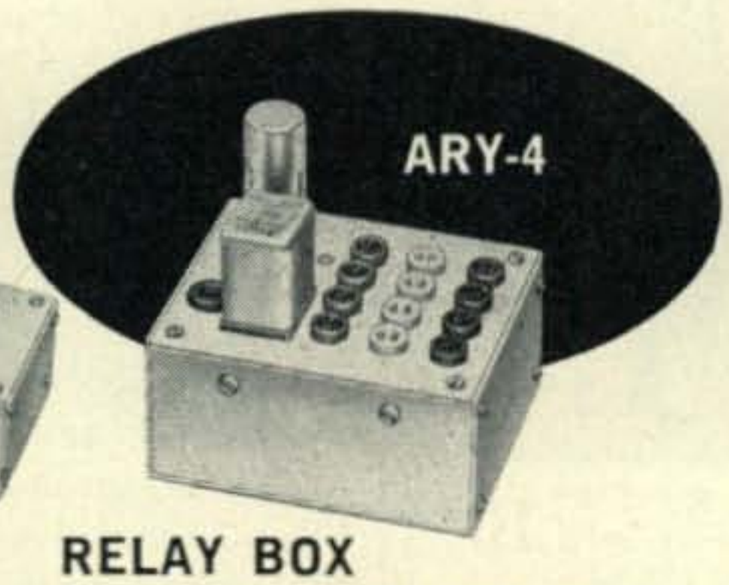
144 mc
MULTIPLIER/AMPLIFIER
The AOA-144 uses two 6360 tubes providing 6 to 10 watts output. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate power: 250 vdc @ 180 ma.
AOA-144 complete.....$39.50



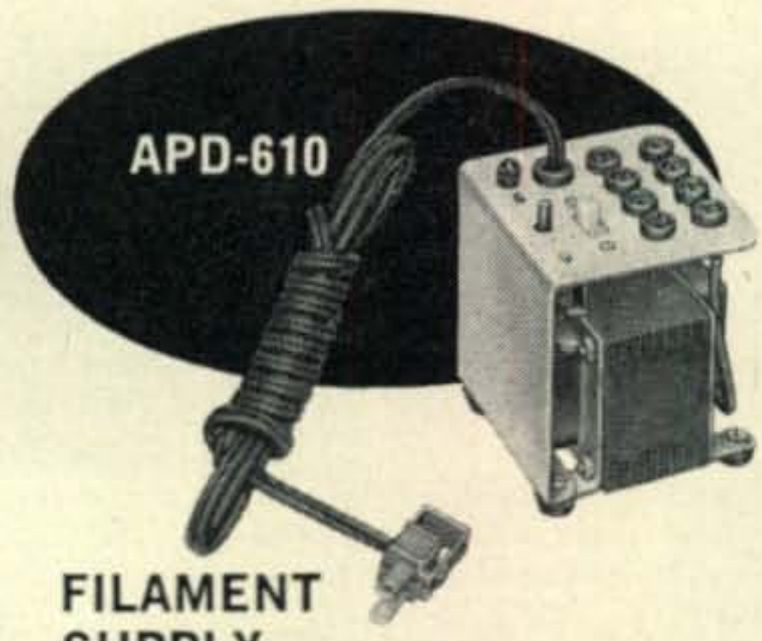
220 mc
MULTIPLIER/AMPLIFIER
The AOA-220 uses two 6360 tubes providing 6 to 8 watts output on 220 mc. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate: 250 vdc @ 150 ma.
AOA-220 complete.....$39.50



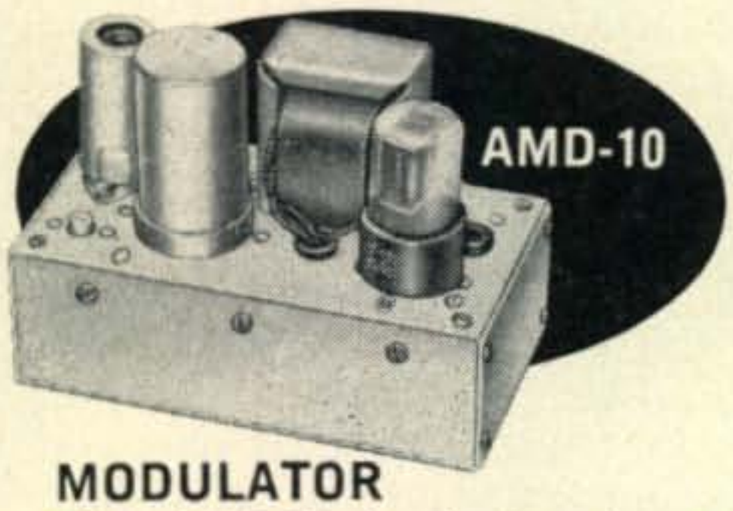
420 mc
MULTIPLIER/AMPLIFIER
The AOA-420 uses two 6939 tubes providing 4 to 8 watts output on 420 mc. Requires AOA-57 plus AOA-144 for drive. Heater: 6.3 volts @ 1.2 amps. Plate: 220 vdc @ 130 ma.
AOA-420 complete.....$69.50



RELAY BOX
Four circuit double throw. Includes coil rectifier for 6.3 vac operation.
ARY-4 Relay Box complete $12.50



FILAMENT SUPPLY
The APD-610 provides 6.3 vac @ 10 amperes.
APD-610 complete.....$9.50



MODULATOR
The AMD-10 is designed as a companion unit to the AOA series of transmitters. Uses 6AN8 speech amplifier and driver, 1635 modulator. Output: 10 watts. Input: crystal mic. (High Imped.) Requires 300 vdc 20 ma, no signal, 70 ma peak: 6.3 vac @ 1.05 amps.
AMD-10 complete $24.50

COMPLETE TRANSMITTER

6 METERS	50 mc	AOD-57
2 METERS	144 mc	AOD-57 PLUS AOA-144
	220 mc	AOD-57 PLUS AOA-220
	420 mc	AOD-57 PLUS AOA-144 PLUS AOA-420

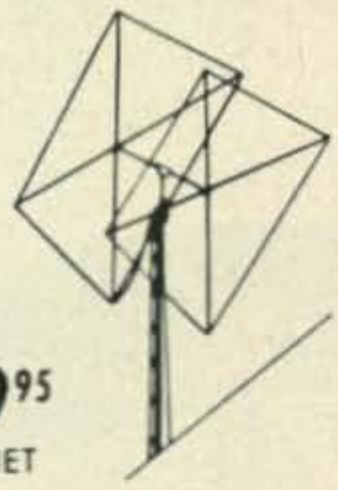
INTERNATIONAL CRYSTAL MFG. CO. INC.
18 NORTH LEE — OKLA. CITY, OKLA.

Order Direct from International

For further information, check number 15, on page 110

INCREASE

RANGE AND QUALITY



Giant Q-11

BASE STATION

CUBICAL QUAD

For Class D, 27-mc operation

Light but rugged, it increases CB range. SPECIFICATIONS: 8 db Forward Gain; 40 db Front to Back; 52 ohm coax Feed; horizontal or vertical polarization; Longest Element, 9'3"; Boom, 65½"

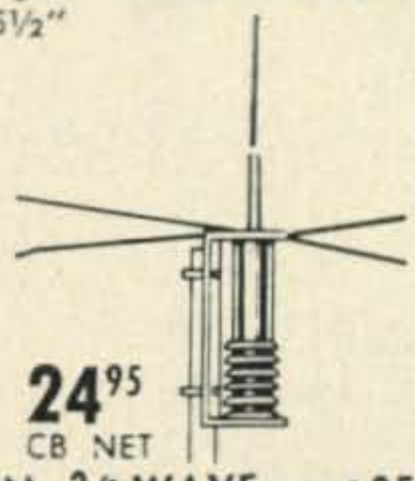
39.95 NET

CB-5 GROUND PLANE

Half wave gives more gain than ¼ wave without bulky transformers. SPECIFICATIONS: VSWR (50 ohm cable) 1.3:1 • Bandwidth (under 2.1 VSWR) ± 4%

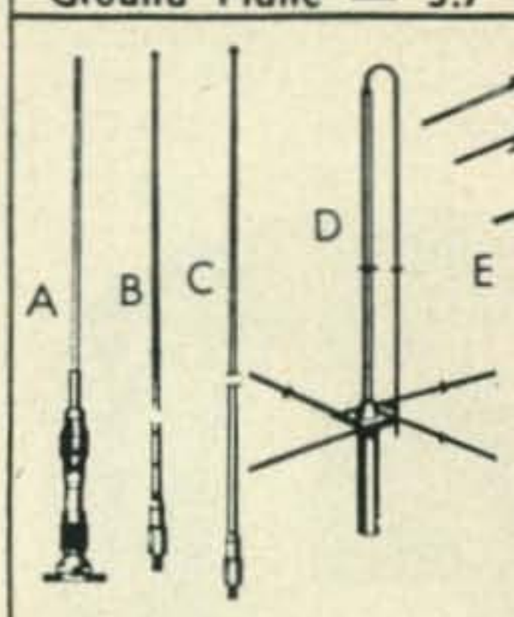
- 750 watts max. power input
- 50 ohm nominal input imp.
- Intnl. feedline RG-8A/U

Termination SO. 239



24.95 CB NET

NEW AM-106 BASE STATION. ¾ WAVE Ground Plane — 3.7 DB Gain. Net . . . 34.95



GUTTER MOUNT CG-275 7.95 NET

MMM-75 MOUNT 7.95 NET

UNIVERSAL MOUNT TM-1 4.45 NET

A CB-1 Air Sentry "Shorty" — 23" overall with 18" whip — top loaded fiberglass — complete with spring, mount and 12 ft. coax cable. For auto CB use. **10.95**

B CBS-311 mounts on top, fender or trunk lid. 52 ohms, 60 watts, RG 58 or equiv., 1.5 mc min., 1.1 to 1 at resonant frequency. For auto, plane or boat. **5.25**

C FG-103 universal 103" fiberglass whip with ⅜" x 24 thread base fitting. **6.95**

(Not Shown) 100-1035 Stainless Steel 103" whip with ⅜" stud threaded to fit all mounts. **6.95**

D SR-600-11 base station monopole for 11 meters. Radiating and ground plane elements grounded to reduce lightning damage. Write for specs. **24.50**

E SR-500-11 3-element beam antenna with power gain approx. 2½ (8DB) in forward direction — about 10 to 1 interference reduction from sides and rear. Handles up to 1 Kw input. 11 Meters **24.95**

SEND FOR "ANTENNA BUYER'S GUIDE" with over 200 Antennas. It's FREE!

Master Mobile Mounts

4125 W. JEFFERSON BLVD. CQ-7
LOS ANGELES, CALIF. 90016
AREA 213, 731-2251

DIVISION OF WHITEHALL ELECTRONICS CORPORATION

For further information, check number 16, on page 110

CLUB FORUM

AL SMITH,* WA2TAQ

WE'RE getting through. Yes, the CLUB FORUM is accomplishing some of the work for which it was intended. How are we aware of these facts? Well, mainly by reader response in the mail.

One of the things we have been doing is referring individual radio amateurs to clubs in their local areas. This, of course, can only be done to the extent of the list of clubs we have on file.

The easiest way to get information on the whereabouts of amateur radio clubs would be on the air. However, many amateurs new to a city may not be able to get a rig working for many reasons and as a result cannot find out the information desired.

Any radio amateur or those interested in becoming radio amateurs desiring information on amateur radio clubs in their area can write to the CLUB FORUM. Incidently any amateur looking for a club to join would probably make a good member, for that reason be sure your club is included in the *CQ* roster of amateur radio clubs.

Did you ever try to get a new amateur radio club started? There are many avenues open to the club organizer. One sure fire method of locating amateurs within the area your new club intends to cover is a name by name check of that very famous publication put out by the folks on Fullerton Ave., Chicago. *The Radio Amateur Call Book* has the information you need, you have but to do the digging for hams in your home town.

It's unfortunate for the club organizer that the call signs in the callbook are listed by call number areas only. Maybe some day we'll see calls listed by counties which would be a boom to amateur organization officials and club officers alike.

Getting back to your excavation job, after completion of your compilation of the callbook listing DO IT AGAIN. Better yet have someone else go through it. You'll probably find at least ten or twenty you missed the first time. A good method is to check or underline each potential member and also put a mark on the top of each page so that you won't have to waste time hunting for check marks when you go back through the pages to make your list.

The idea of all this searching for names is of course to get the word to them that a new club

*504 Beach 43rd St., Far Rockaway, N. Y. 11691.

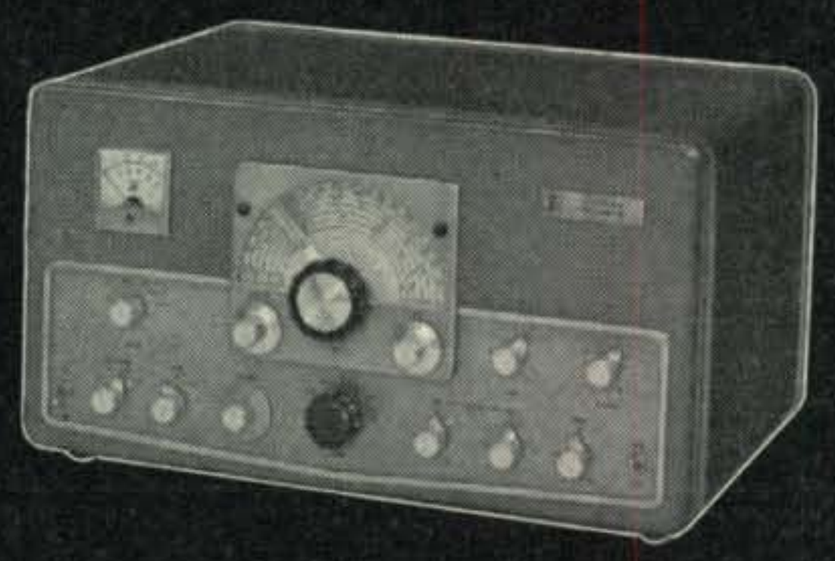
RANGER II

75 WATTS CW
65 WATTS PHONE INPUT!

VALIANT II

275 WATTS CW AND SSB*
200 WATTS PHONE INPUT!

SLICE THRU Q.R.M.



with either of these high performance Viking transmitters

RANGER II—This popular, feature-packed, self-contained transmitter/exciter is available wired and tested or in a complete, easy to assemble kit. As a transmitter, it's a rugged 75 watt CW or 65 watt phone unit—instant bandswitching on 6 through 160 meters—for built-in VFO or crystal control. Temperature compensated VFO is extremely stable—high "Q" pi-network output circuit matches antenna loads from 50 to 500 ohms. Flexible timed sequence keying provides perfect "make" or "break", yet maintains "break-in" advantages of a keyed VFO. As an exciter, without modification, it will drive any of the popular kilowatt level tubes and will provide a high quality speech driver system for high powered modulators. TVI suppressed—with tubes, less crystals.

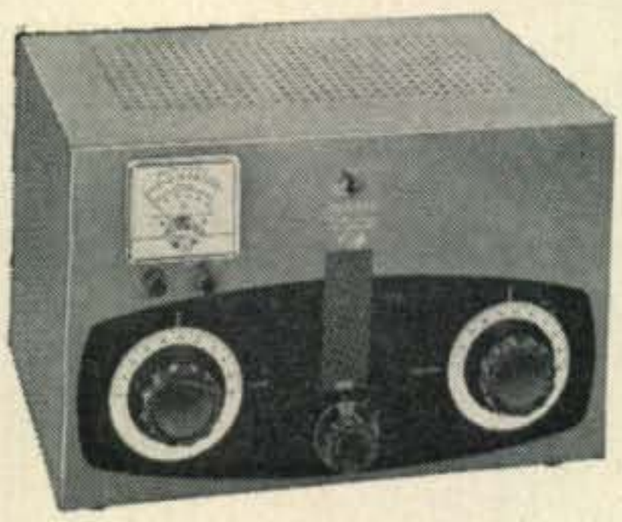
Cat. No. 240-162-1.....**"Ranger II" Kit**.....**Net $249.50**
Cat. No. 240-162-2.....**"Ranger II" Wired**.....**Net $359.50**

*with auxiliary SSB exciter

VALIANT II—Here's the unit that gives you outstanding flexibility and performance in a compact, desktop rig! Low level audio clipping prevents over-modulation and increases modulation level and intelligibility for increased communications power. Differentially temperature compensated VFO is highly stable—operates in the 1.75 to 2 mc. and 7.0 to 7.45 mc. ranges. Other features: Instant bandswitching 160 through 10 meters . . . complete TVI suppression . . . timed sequence (grid block) keying . . . high gain push-to-talk audio system . . . built-in low pass audio filter . . . self contained power supply . . . control mode switching . . . high efficiency pi-network tank circuit. With tubes, less crystals.

Cat. No. 240-105-1.....**"Valiant II" Kit**.....**Net $375.00**
Cat. No. 240-105-2.....**"Valiant II" Wired**.....**Net $495.00**

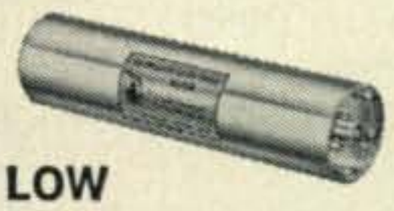
BOOST YOUR ANTENNA EFFICIENCY!



MATCHBOXES
Bandswitching —no plug-in coils!

Complete integrated antenna matching and switching systems for CW and AM transmitters up to 275 Watts or one Kilowatt. No annoying "plug-in" coils; eliminates "load-tapping". Bandswitching 80 thru 10 meters.

Cat. No. — **Amateur Net**
250-23-3...275 Watts, with directional coupler and indicator...**$94.95**
250-23-1...275 Watts, less directional coupler and indicator... **64.95**
250-30-3...1 Kilowatt, with directional coupler and indicator **.154.50**



LOW PASS FILTER

Wired, pretuned. Handles more than 1000 Watts RF—75 db or more attenuation of harmonic and spurious frequencies above 54 mc.

Cat. No. 250-20 52 Ohms Impedance..**$14.95 Net**
Cat. No. 250-35 72 Ohms Impedance..**$14.95 Net**

DIRECTIONAL COUPLER AND INDICATOR

Provides continuous reading of SWR and relative power in transmission line. May be permanently installed in 52 ohm coaxial line. Easily handles maximum legal power. Wired and tested.

Cat. No. 250-37 ..Coupler..**$11.75 Net**
Cat. No. 250-38..Indicator..**$25.00 Net**

WRITE TODAY

for your free copy of Catalog 965 with complete specifications and prices on all Johnson Amateur equipment.

E. F. JOHNSON COMPANY
1725 Tenth Ave. S.W. • Waseca, Minnesota 56093

For further information, check number 17, on page 110

THE UNIQUE

Joystick

VARIABLE FREQUENCY ANTENNA

The DX Antenna for any QTH!

Hear and work that spicy DX with the Joystick—End the frustration of "hunk of wire" contacts—Now you can put out the kind of signal your transmitter was designed to produce—yes, even from *inside* an apartment or home!

The complete systems listed below comprise deluxe or standard Joystick (as indicated) plus Joymatch Tuner-s & everything else required apart from existing transmitter and/or receiver.

A lifetime of experience and antenna "know-how" has gone into the development of this revolutionary "Variable Frequency Antenna" on which World Patents are pending. Uniformly excellent performance on all bands from 160 thru 10 meters. The Joystick's special matching and feeding system insures top efficiency on any frequency. Complete systems are available for s.w.l.'s and mobile, too. Thousands of Joysticks are in use around the world.

Flash! Indoor Joystick spans the earth on 3.5 mcs.
ZL4GA reports: I contacted G5WP on 3504 Kcs with INDOOR JOYSTICK and am REALLY AMAZED" (569 BOTH WAYS).
W3AZR reports: QSO with W2EQS on 160. W2EQS was 589 on his 160M DIPOLE (the well known Atlantic Spanner!) and 56/79 on an INDOOR JOYSTICK 5' UNDERGROUND IN BASEMENT!!!!!

ORDER YOUR JOYSTICK NOW

Full money-back GUARANTEE if you're not completely satisfied.

Still not convinced? Complete the coupon for a detailed brochure and testimonials.

Please ship Joystick system checked below:

- ☐ Complete Deluxe Joystick Transmitting System (Shipg. to USA Incl.) $24.00
- ☐ Same as above, but Standard model $21.15
- ☐ Complete Deluxe Joystick Receiving System (Shpg. to USA Incl.) $20.85
- ☐ Same as above, but Standard model $18.00
- ☐ Complete Joystick Mobile System (Shpg. to USA Incl.) $21.10
- ☐ Please send brochures and testimonials.

Name..... Call.....

Address.....

City..... State..... Zip Code .....

Partridge Electronics, Ltd.

7 SOWELL STREET BROADSTAIRS, KENT, ENGLAND

For further information, check number 18, on page 110

is in the offering and to advise them as to when and where a meeting will take place to get things organized.

We said that amateurs seeking to join clubs could get much information "on the air." The same advice goes for recruiting club members. When you hear a good strong local type signal check your call book to see if it is coming from an area to be covered by the proposed club. If it is a local then look for a chance to QSO the station (I didn't say break in) and let it be known that a club is forming.

Get conversations on the subject of the new club started in your QSOs. Amateurs are notorious evesdroppers, you can bet that many will be looking to get into your round table. It would be a good idea to pause and let it be known that breaking stations are welcome. You might even investigate a "club organizing Net" on the favorite local band on a regular schedule so that those not too active can tune in and get information on the new doings in town.

Newspaper coverage on your new club is a must. Let it be known that a club is being formed and supply your newspaper with an address where inquiries can be made.

For additional information on publicity and public relations refer to the CLUB FORUM in the March 1965 issue of *CQ*.

Don't overlook the posting of a notice of the new club on the bulletin board or publication of any local industry involved in electronics. Chances are good that many amateurs will be among the employees. Spread the word to any ham gathering places such as local electronic supply houses or surplus establishments. Ask the counter help to pse QSP.

The CLUB FORUM will announce formation of new clubs and will include information as to who to who to contact for further information. We might remind our readers that your notice would not be read for from two to three months following its receipt at the CLUB FORUM.

A new club in the Brooklyn, N. Y. area is the Flatbush Radio Club. Those interested can contact Lew Levitt, WB2NDI for further information.

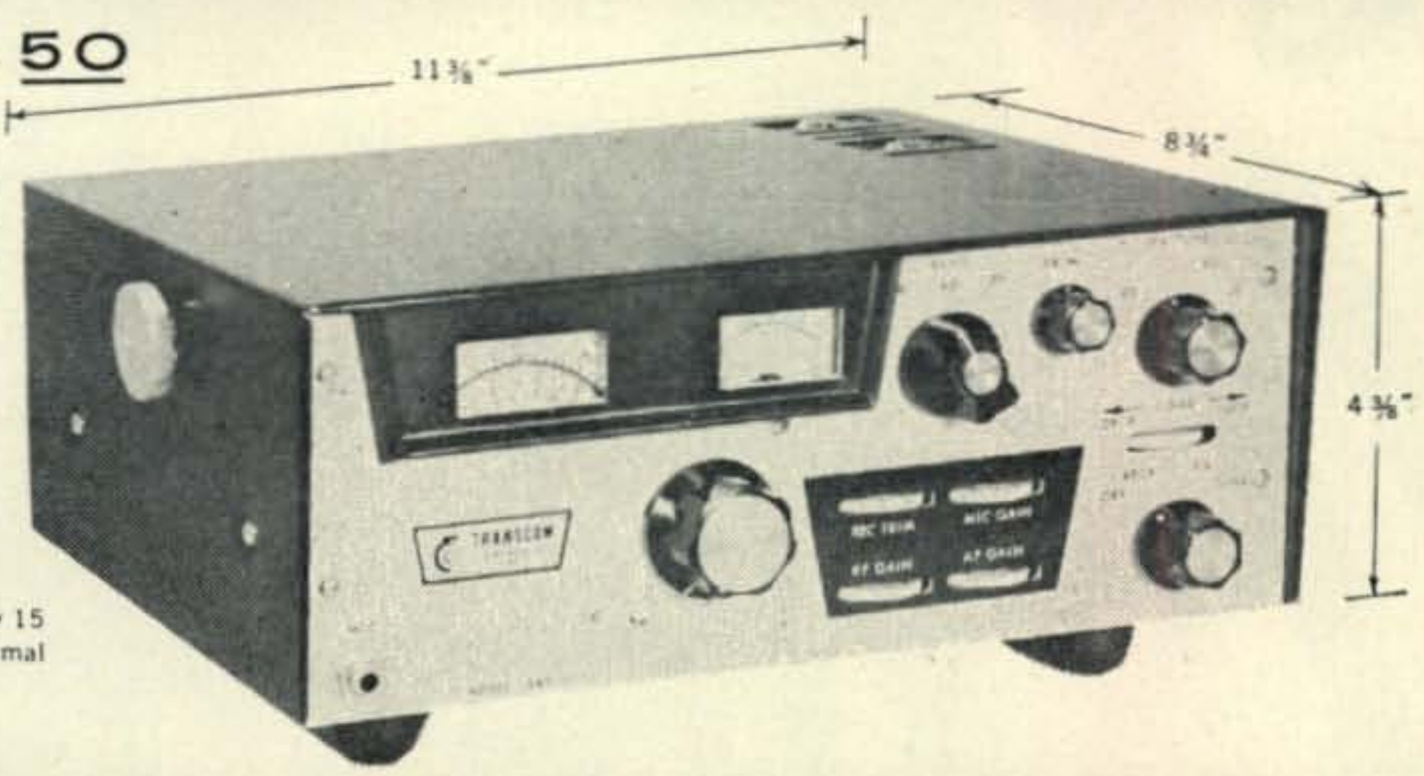
In this day of many changes in the radio field it would be a good idea for all clubs to consider the addition of the word "amateur" in their club name if it is not already included. This could prove to be a hardship to those with much printed matter on hand, however it would be prudent to consider the change when present supplies run out.

One other source of securing a list of hams for the new club is your ARRL and/or ARPSC officials in your county, Section and Division. Check with the county Emergency Co-ordinator. He will probably be happy to supply a list of ARPSC members in the vicinity. In many cases the roster of the county EC may make one complete enough to form a club. Don't overlook contacting both RACES and MARS officials in your area.

[*Continued on page 98*]

Here's the SPECTACULAR
NEW ALL TRANSISTOR
SBT-3 SSB TRANSCEIVER

PRICED AT ONLY $299.50



SPECIFICATIONS

Freq. Range: 3780-4010 KC, 7180-7320 KC, 14130-14360 KC

Semiconductors: 2—8042 instant heating tubes, 18 transistors, 2—varicaps, 1—zener, 9 diodes

Size: 4⅜H x 11⅜W x 8¼D. Weight 10 lbs.

TRANSMITTER

Power Input: 165W pep

Carrier Suppression: —45 DB

S.B. Selection: 80-40M lower 20M upper

Unwanted SB: —40 DB

Ant. Imped.: 30-100 ohm adj.

Power Consumption: .5 amps Receive, 12-15 amps SSB XMIT.

Operation: P. T. T. No tube filament on in rec.

RECEIVER

Sensitivity: .5μv for 10 DB S + N/N

Selectivity: 3 KC @ 6 DB

Spurious: Image better than 60 DB

Stability: Less 100 cps in any 15 min. period under normal ambient conditions

Audio Output: 2 watts

TRANSCOM ELECTRONICS, INC.

375 HALE AVENUE ESCONDIDO, CALIFORNIA

For further information, check number 31, on page 110

CRYSTALS are not all the same!

TEXAS CRYSTALS quality is outstanding as evidenced by use in numerous government space projects where there's no compromise with quality, reliability or accuracy. For commercial two-way, ham operation or special frequency control crystals, Texas Crystals are your best buy.

If your dealer is temporarily out of stock or does not carry Texas Crystals, send us his name along with your order. Minimum order, check or C.O.D. is $5.00. Add 5¢ per crystal for postage, 10¢ for air mail.

Send for Free Catalog with Circuits

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Los Angeles, California 90016
Phone 213 — 731-2258

A Division of Whitehall Electronics Corp.

For further information, check number 32, on page 110

COMMAND THE BAND

with the NEW HAMMARLUND HXL-1 linear amplifier

Regardless of the exciter you are now using—the HX-50, the HX-500, or any one of a host of compatible competitive units, you will TAKE COMMAND the moment you're hooked up to the incredible HXL-1.

The HXL-1 is so rugged, it can be held "key down" at a kilowatt for more than an hour . . . without damage. It delivers the full metered legal power of 1 KW CW input—1500 W PEP input. Here is a "no-nonsense" linear that delivers the power you pay for—the performance you want.

Send for complete technical literature today—or see and try it at your nearest authorized Hammarlund distributor.

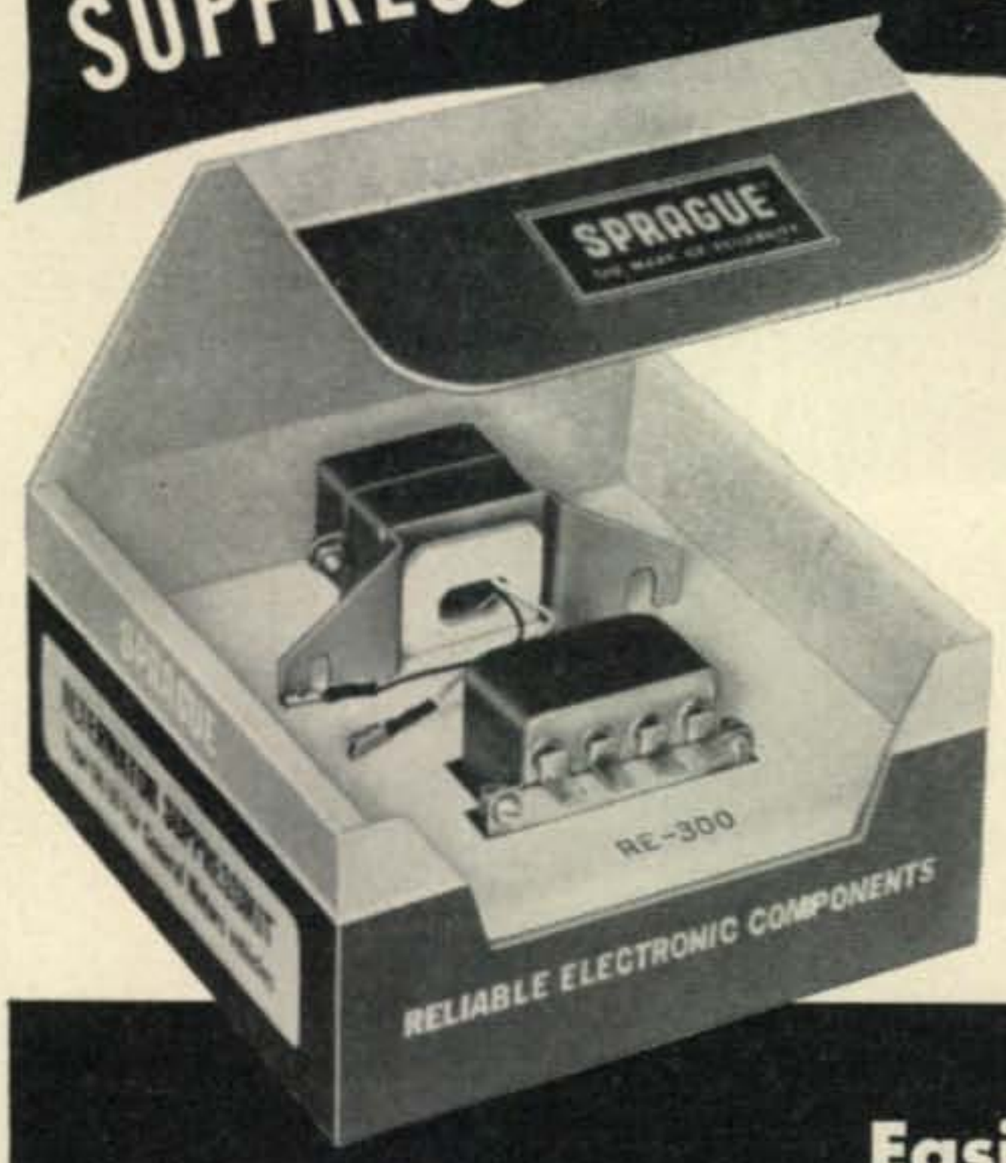
FEATURES

- Complete coverage—80 to 10 meters
- Broad Banded Input Circuit
- 3 Element adjustable Pi-network output
- Built-in multi-purpose meter including linearity test
- Control circuitry compatible with most transmitters and transceivers (i.e. HX-50, HX-500, "S" line and KWM1, KWM2, etc.)
- Efficient Ground-grid circuit using 2 high dissipation triodes (United 572A)
- Husky, self-contained solid state power supply with silicon rectifiers
- Only connection required between exciter and amplifier is a coax cable. All relay switching built into amplifier.
- Power nacked performance on SSB, CW and AM. 1500W PEP* input; 1 KW CW input
- Designed for 115/230 volt operation
- Same physical size as the Fabulous HX-50. (17½" wide; 9½" deep; 9⅛" high)

HAMMARLUND MANUFACTURING COMPANY
A GIANNINI SCIENTIFIC COMPANY
73-88 Hammarlund Drive • Mars Hill, North Carolina 28754

For further information, check number 20, on page 110

SUPPRESS RFI IN YOUR MOBILE RADIO GEAR!



NEW! SPRAGUE SUPPRESSIKITS FOR VEHICLES WITH ALTERNATOR SYSTEMS

Easily installed on cars or trucks with citizens' band, amateur, industrial, or public service mobile radio equipment

★ Three different Suppressikits to choose from —Type SK-10 for Chrysler Corp. cars and trucks, Type SK-20 for Ford Motor Co. vehicles, and Type SK-30 for General Motors Corp. equipment.

★ Designed to fit most newer vehicles through the 1965 model year. (for older vehicles, see the SK-1 Suppressikit, below.)

★ Well-engineered L-C Networks and/or heavy-duty Thru-pass Capacitors handle the hash and eliminate the siren-like whine caused by the alternator output.

★ Extremely easy to install—no cutting, no soldering, no wiring harnesses. All components are neatly marked and packaged, and come complete with comprehensive step-by-step installation instructions.

★ Provide really *effective* interference suppression through 400 mc, at moderate cost.

★ Will stand up under continuous operation in hot engine compartments.

★ Permit faster, more readable, less tiring communication at greater ranges.

TYPE SK-1 SUPPRESSIKIT FOR VEHICLES WITH D-C GENERATORS

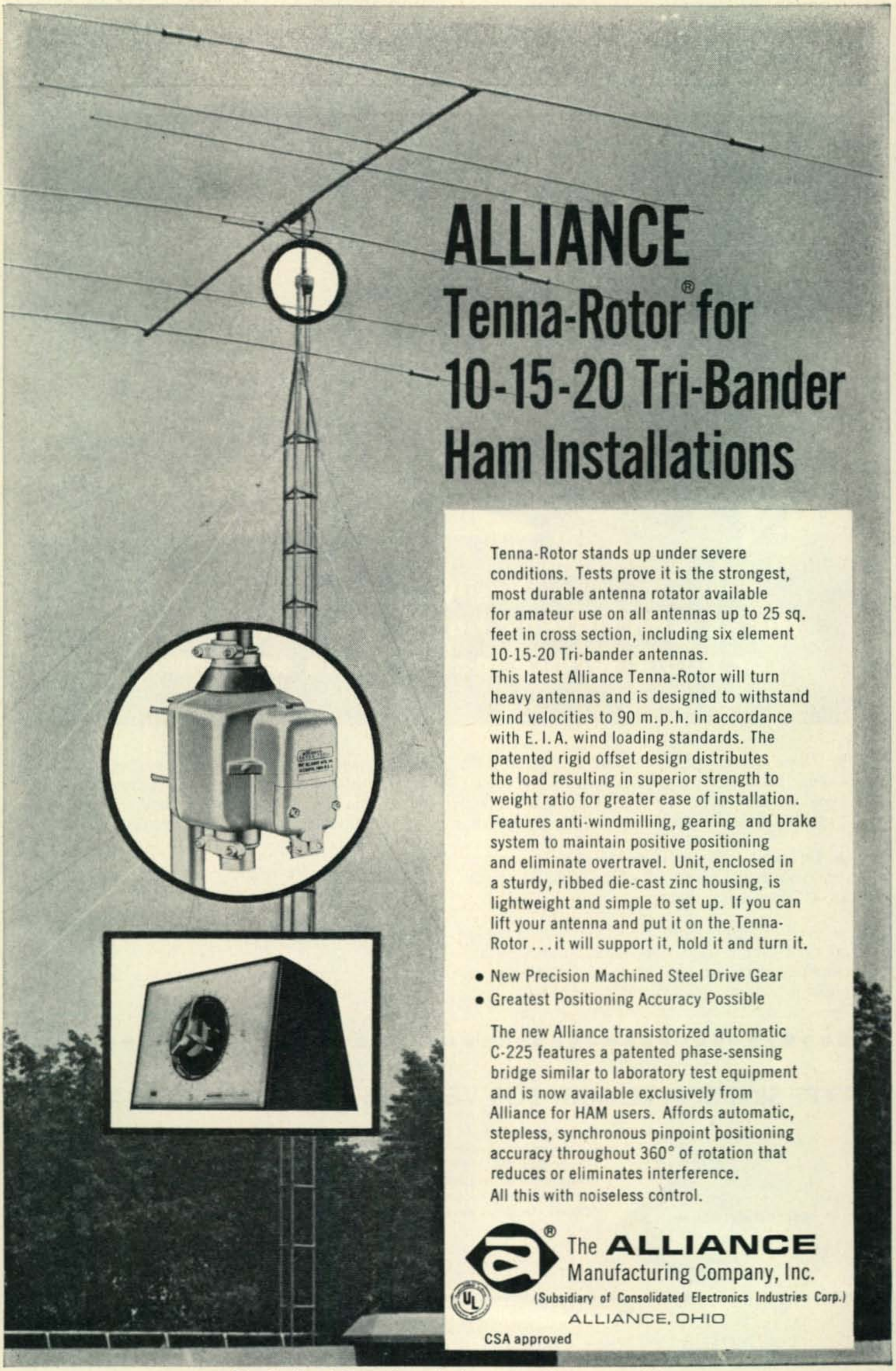
Designed for simple but effective installation. The generator capacitor is built for continuous heavy duty 257°F (125°C) operation. A full 60 ampere current rating plus the high rated operating temperature provide an extra factor of safety against expensive generator burnouts, unlike many suppression assemblies containing general-purpose capacitors. Effectively suppresses RFI through 400 mc. Includes easy-to-follow installation instructions.

SPRAGUE®
THE MARK OF RELIABILITY

GET YOUR SUPPRESSIKIT FROM A SPRAGUE DISTRIBUTOR TODAY !

65-519

For further information, check number 21, on page 110



ALLIANCE
Tenna-Rotor® for 10-15-20 Tri-Bander Ham Installations

Tenna-Rotor stands up under severe conditions. Tests prove it is the strongest, most durable antenna rotator available for amateur use on all antennas up to 25 sq. feet in cross section, including six element 10-15-20 Tri-bander antennas.

This latest Alliance Tenna-Rotor will turn heavy antennas and is designed to withstand wind velocities to 90 m.p.h. in accordance with E.I.A. wind loading standards. The patented rigid offset design distributes the load resulting in superior strength to weight ratio for greater ease of installation.

Features anti-windmilling, gearing and brake system to maintain positive positioning and eliminate overtravel. Unit, enclosed in a sturdy, ribbed die-cast zinc housing, is lightweight and simple to set up. If you can lift your antenna and put it on the Tenna-Rotor . . . it will support it, hold it and turn it.

- New Precision Machined Steel Drive Gear
- Greatest Positioning Accuracy Possible

The new Alliance transistorized automatic C-225 features a patented phase-sensing bridge similar to laboratory test equipment and is now available exclusively from Alliance for HAM users. Affords automatic, stepless, synchronous pinpoint positioning accuracy throughout 360° of rotation that reduces or eliminates interference.

All this with noiseless control.

The **ALLIANCE** Manufacturing Company, Inc.

(Subsidiary of Consolidated Electronics Industries Corp.)

ALLIANCE, OHIO

CSA approved

For further information, check number 22, on page 110

FOAMFLEX COAXIAL CABLE KITS

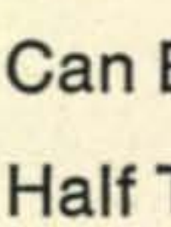
a complete all-in-one package for transmitter-antenna hook-ups

Low SWR Foamflex Coax offers:

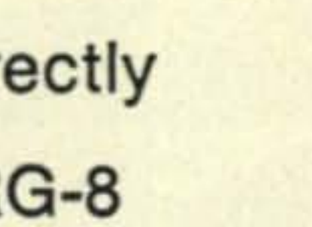
- No TVI
- Can Be Buried Directly
- Half The Loss of RG-8
- No Deterioration With Time

Used By The Military, Used With PROJECT OSCAR

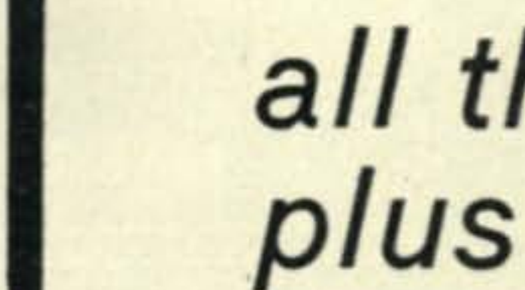
all this plus simple connectors, holding straps and tape!



25' ROLL OF SPECIAL PRESSURE-SENSITIVE TAPE TO TIE FOAMFLEX TO TOWER



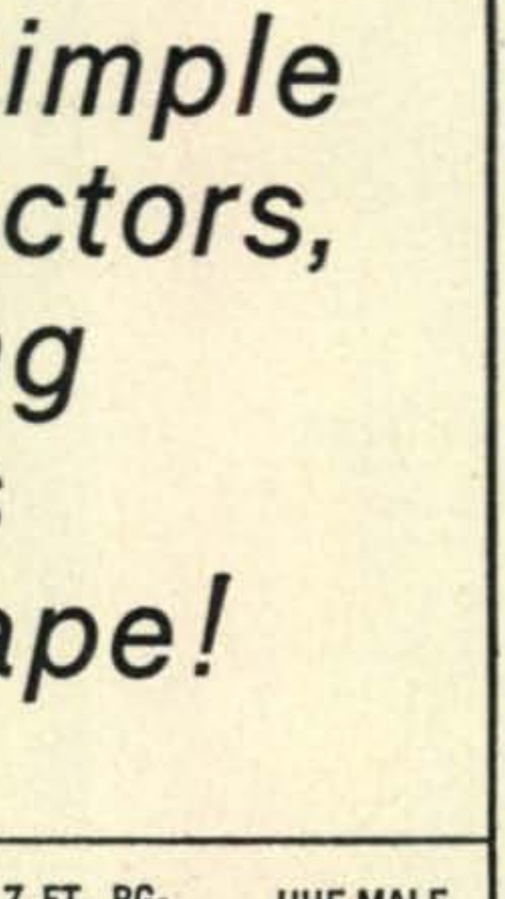
25' ROLL OF TAPE TO WEATHER-PROOF YOUR ANTENNA CONNECTION



TWO CABLE CLIPS TO ATTACH CABLE TO WALL OR CEILING OF YOUR SHACK

7 FT. RG-8A/U FLEXIBLE JUMPER TO CONNECT TRANSMITTER TO CABLE SYSTEM (CONNECTORS FURNISHED SEPARATELY)

UHF MALE CONNECTOR (TYPE PL-259)

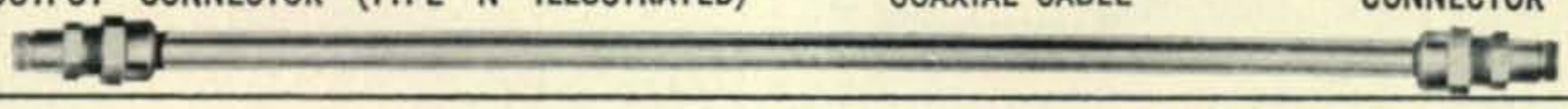


TYPE N MALE CONNECTOR

FEMALE CONNECTOR TO MATE WITH ANTENNA OUTPUT CONNECTOR (TYPE N ILLUSTRATED)

½-50 OHM FOAMFLEX COAXIAL CABLE

TYPE N FEMALE CONNECTOR



KIT 50N $47.25
☐ Contains 50' Foamflex ½" diameter 50 ohm cable, Type N connectors recommended for use above 6 meters, plus items illustrated.

KIT 100N $72.25
☐ Identical to above kit but with 100 feet of Foamflex coaxial cable.

KIT 50NB $51.25
☐ Contains 50' Foamflex ½" diameter, 50 ohm cable with Habirlene outer jacket to permit direct burial. Type N connectors, section of RG-8/U with connectors, holding straps, two types of tape included.

KIT 100NB $80.25
☐ Identical to above kit but with 100 feet of Foamflex Habirlene-jacketed cable.

KIT 50UHF $45.50
☐ Includes 50' Foamflex ½" diameter, 50 ohm cable, UHF connectors, plus all items illustrated.

KIT 100UHF $69.50
☐ Identical to above kit but with 100' of Foamflex coaxial cable.

KIT 50UHFB $48.50
☐ Contains 50' Foamflex ½" diameter, 50 ohm cable with Habirlene outer jacket to allow direct burial. Type UHF connectors and all items pictured.

KIT 100UHFB $77.50
☐ Identical to above kit but containing 100 feet of Habirlene-jacketed Foamflex cable.

PHELPS DODGE ELECTRONIC PRODUCTS
60 DODGE AVE., BOX 187, NORTH HAVEN, CONN. 239-3311 (203) TWX 203-772-0287

ORDER BY MAIL!

Check or money order is enclosed for the kit checked. Please ship postpaid. (Sorry, no C.O.D.'s)

☐ Kit 50N	$47.25	☐ Kit 100N	$72.25
☐ Kit 50NB	$51.25	☐ Kit 100NB	$80.25
☐ Kit 50UHF	$45.50	☐ Kit 100UHF	$69.50
☐ Kit 50UHFB	$48.50	☐ Kit 100UHFB	$77.50

☐ Send kit checked above but include ____ extra feet of Foamflex at additional cost of 50¢ per foot, 60¢ per foot for Habirlene jacketed.

NAME_____

ADDRESS_____

_____

For further information, check number 23, on page 110

Behind This Honest Face

Heath Deluxe SB-Series Tuning Dial — with features proven by thousands of satisfied SB-Series owners . . . features you can prove for yourself!

• Calibration accurate to 400 cps on all bands • Readable to 200 cps • Bandspread equal to 10 feet per megacycle • Uniform ⅛ inch spacing between all 1 kc dial divisions • Backlash less than 50 cps

HEATHKIT®

HEATH COMPANY, Dept. 12-7, Benton Harbor, Michigan 49023
In Canada: Daystrom, Ltd., Cooksville, Ontario

☐ Enclosed is $_____, plus shipping.

Please send model (s)_____

☐ Please send free 1965 Heathkit Catalog.

Name_____
(Please Print)

Address_____

City_____ State_____ Zip_____

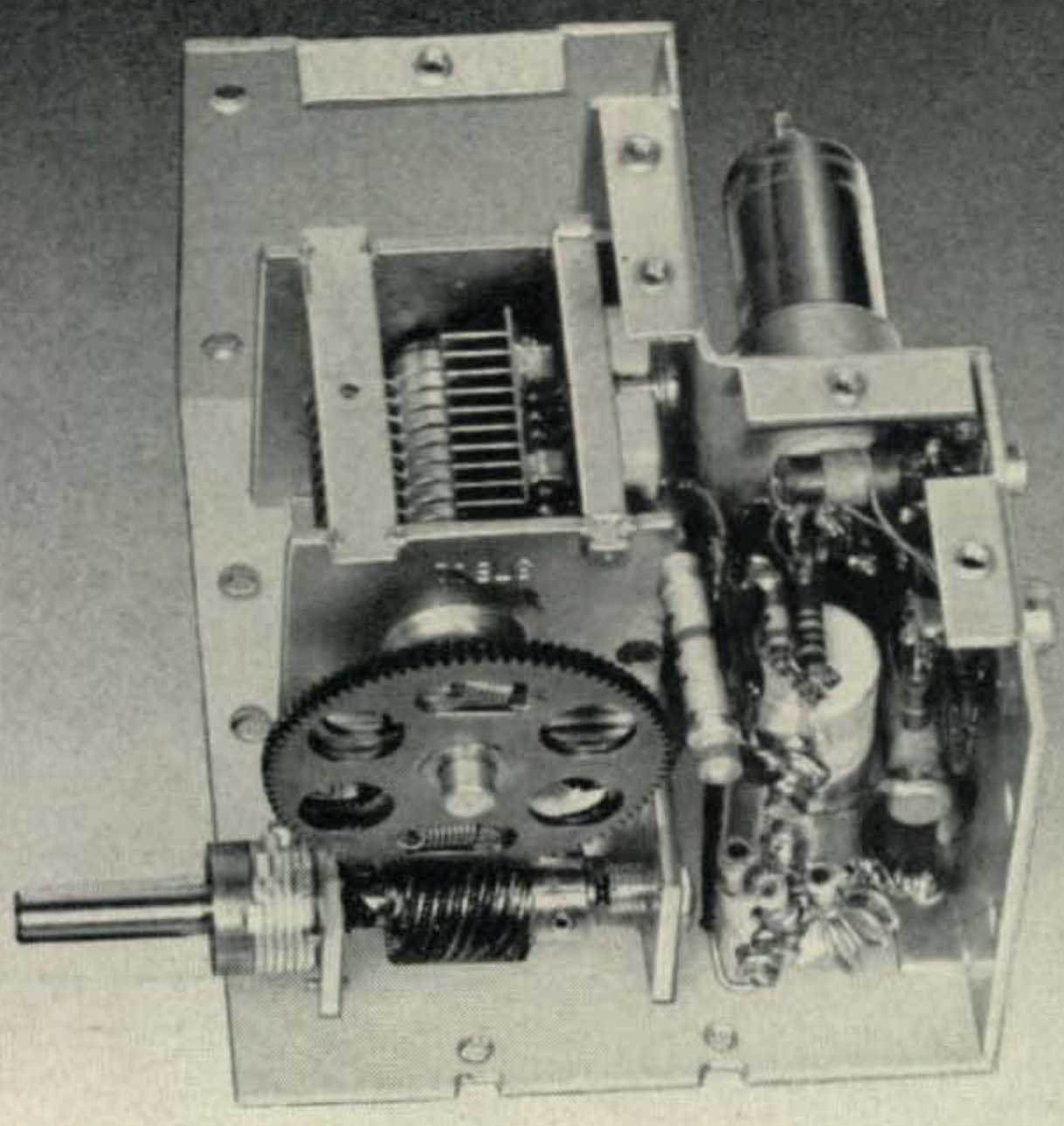
Prices & specifications subject to change without notice. AM-156

FREE 1965 HEATHKIT CATALOG

See the wide array of Heathkit Amateur Radio Equipment available at tremendous do-it-yourself savings! Everything you need in "mobile" or "fixed" station gear with full descriptions and specifications. Send for Free copy!

For further information, check number 24, on page 110

...Beats A Stout Heart



Heath Deluxe SB-Series LMO (Linear Master Oscillator) — with features factory built into the heart of every SB-300 and SB-400 . . . features you can prove for yourself!

• True linear tuning . . . (within 400 cps) • Stable—less than 100 cps per hour maximum drift after warmup • Tuning repeatability better than 50 cps • Rigid mechanical construction • Highest quality components assure years of dependable performance

HEATH SB-SERIES PERFORMANCE IS A PROVEN FACT!

Operate 80 through 10 meters on either the SB-300 Receiver or the SB-400 Transmitter—experience the same precision tuning and near-perfect stability on both. And all these features will be included in the 6 meter SB-110 coming in August. But why prove these features on someone else's rig? Order your SB-300 and SB-400 today.

Kit SB-300, less speaker, 23 lbs. . . . $27 dn., $22 mo. **$265.00**

Export model available for 115/230 VAC, 50-60 cps: write for prices.

Kit SB-400, 33 lbs. . . . $33 dn., as low as $22 mo. **$325.00**

Export model available for 115/230 VAC, 50-60 cps: write for prices.

Front view of the KSSB-2, the offspring of the Sideband Package and the SB-8. The controls are, top, MIC GAIN, EXCITATION, P.A. TUNE and LOADING (dual). Bottom, BANDSWITCH, EXCITER TUNE, V.F.O. TUNING, MODE SWITCH, SIDE BAND SELECTOR, METER SWITCH. The output frequency (in mc) is the sum of the BANDSWITCH freq plus the V.F.O. dial reading (in kc).

The KSSB-2 Sideband Exciter

BY KENNETH SCHOFIELD*, W1RIL

The KSSB-2 is a homebrew s.s.b. transmitter, the result of the merging of the Sideband Package and the SB-8. This exciter, contained in 12½" x 5½" x 9" cabinet, is rated at 50 watts and features a.l.c., vox and anti-vox.

THE urge to go s.s.b. has hit many an amateur during the past few years. Several excellent construction articles have appeared in publications on s.s.b. and many of the leading manufacturers have offered s.s.b. gear in their lines. The construction articles, more often than not, have one or two features not wanted, or generally frowned upon by some of the constructing members of the Ham clan. The manufactured s.s.b. gear is fine for those who have the means, but many haven't.

Being in the latter class, and realizing after the 1964 *CQ World Wide Contest* that s.s.b. is a must, plans were made to make this mode of transmission possible at W1RIL.

This is not to be considered a construction article in the strictest sense. It is offered to show what can be done with two excellent circuits, cut, and combined in a new package. The pictures show the end product. The net result of the effort is the KSSB-2 an offspring of the Sideband Package[1] and the SB-8.[2]

Several changes were made to both units in the mating process. Changes to the Side-band Package were:

1. The final plate circuit was changed to a pi-network which is switched by ganging to the main bandswitch. The r.f. output indicating circuit of the SB-8 was added.

2. A shield was run across the underside of the 6AK6 driver socket to eliminate instability in this stage. The stage was so stable after the installation of the shield that neutralization was found unnecessary.

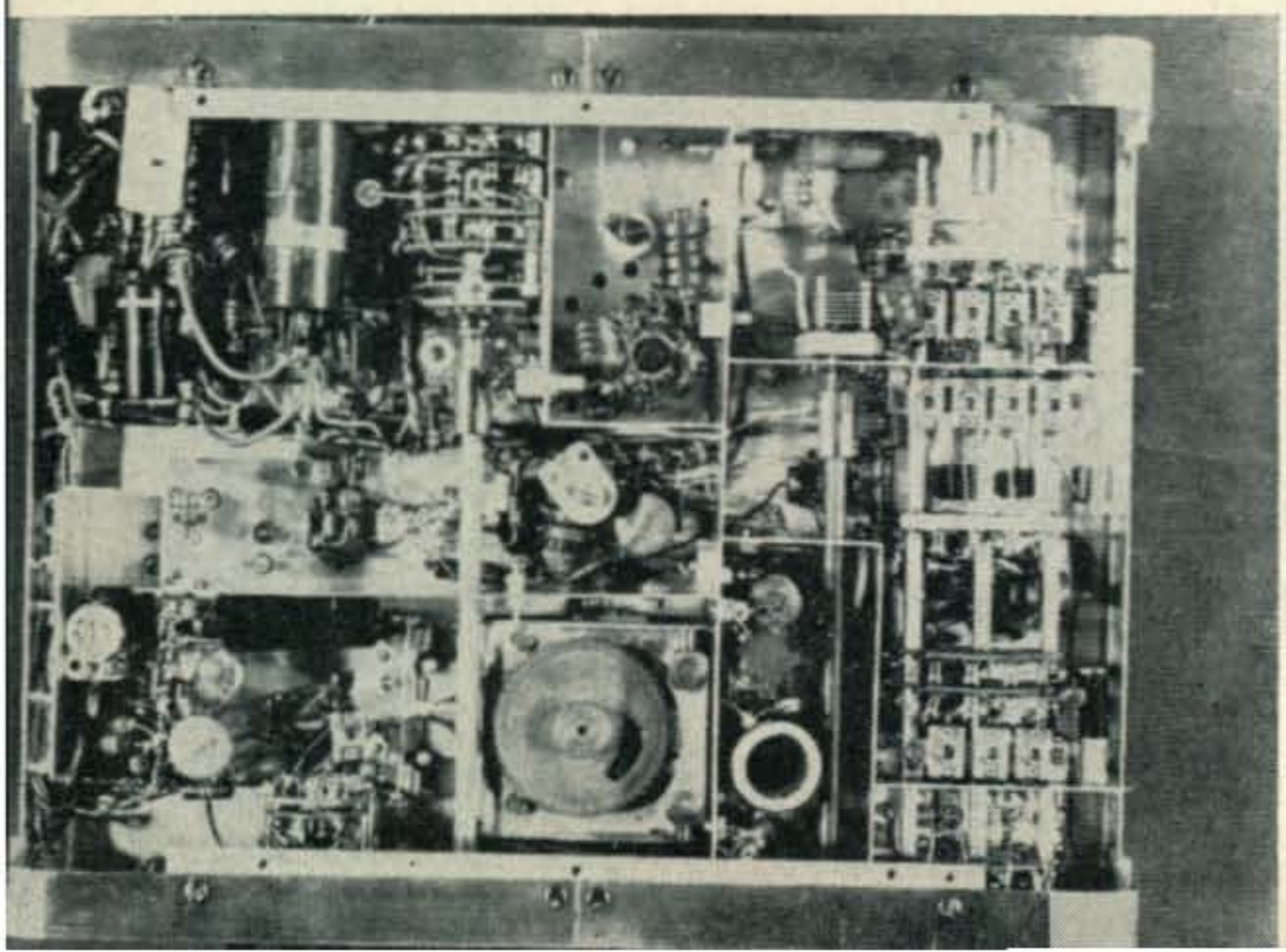
3. Modifications for 200 kc coverage on all bands 80 through 15 meters with three 200 kc segments on 10 meters.

4. V.f.o. coverage was confined to 200 kc allowing better resetability and eliminating the need of tuning the 3.5 to 4.0 mc interstage transformer between the 1st and 2nd mixers. This transformer is slightly overcoupled and stagger

*21 Forestdale Road, Paxton, Mass.

[1]Bigler, G. K., "A Sideband Package," *QST*, June 1958, p. 24.

[2]Smith, H., "The SB-8," *CQ*, Jan. 1964, p. 24.



Bottom view of the KSSB-2. The compartments are: Front, l. to r., Balanced Modulator and 9 mc oscillator; v.f.o. compartment and the bandswitch compartment. The shield between the two rows of trimmer capacitors at the right splits the 6AK6 driver tube socket in half. The grid and cathode connections are in the front compartment and the filament, screen and plate connections are in the rear compartment. The 6146 shield compartment is centered at the rear with all outgoing leads fed through feedthrough capacitors. The mode switch assembly is to the left of the 6146 compartment.

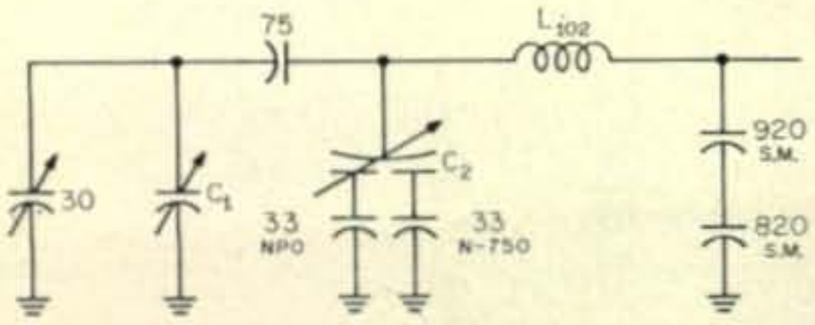


Fig. 1—Modification of the Sideband Package v.f.o.

C_1—Variable from final of ARC-5 trans.
C_2—30 mmf differential capacitor.
L_{102}—28 t. #26, 1" dia. threaded on a ceramic form with ½ turn loop for adjustment.

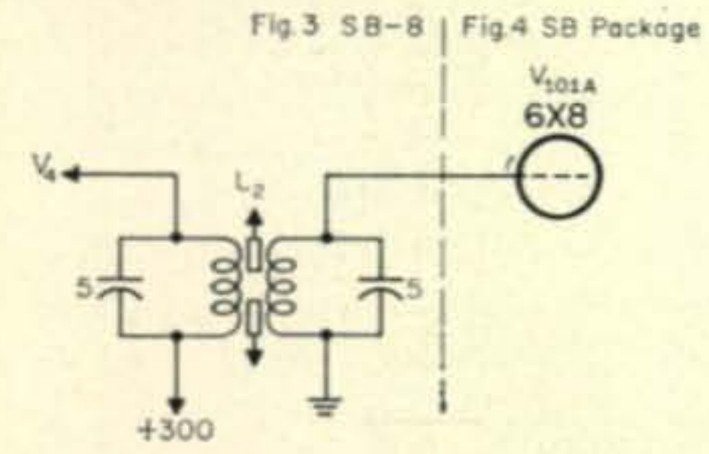


Fig. 2—R.f. mating of the SB-8 and Sideband package. Coil L_2 consists of two windings, each 25 t. #30 CS, separated by ⅛" on a ⅜" diameter slug tuned form. This is placed in a shield can.

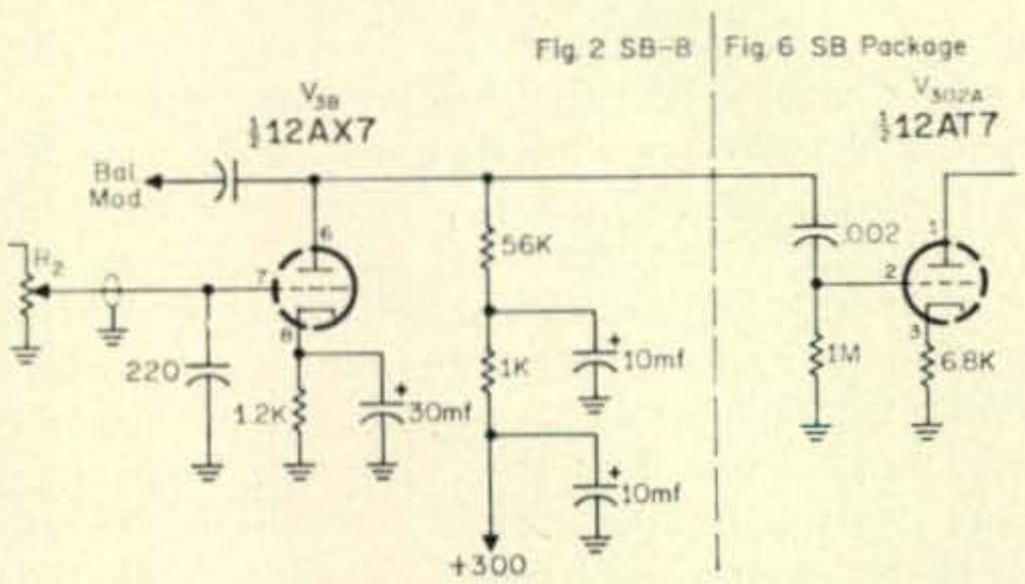


Fig. 3—Audio mating of the SB-8 and the Sideband Package.

tuned to provide a broad response across the 200 kc from 3.8 to 4.0 mc.

5. A differential capacitor was placed in the v.f.o. circuit with an NPO and N750 capacitor on each leg to compensate for any v.f.o. drift. (See fig. 1.)

6. The 455 kc filter of the Side-band Package was eliminated and the circuitry of the SB-8 substituted using a McCoy Silver Sentinel filter. See fig. 2 for the r.f. mating circuit.

Top view of the KSSB-2 with cover removed: Controls on right front sub panel shelf are ALC LEVEL and VOX GAIN. The audio and vox tubes are located to the right of the shielded compartment housing the final. The horizontal tube to the left of the compartment is the alc rectifier. The anti-vox transformer and rectifier are mounted on the rear panel at the left. The 6AK6 driver is to the left of the shielded compartment. The middle row of components, left to right are: 2nd mixer, 3.8 to 4.0 mc transformer, vfo tube, 1st mixer, 9 mcs transformer, 9 mcs amplifier tube, 9 mcs transformer and crystal filter. The front row of components, left to right are: hetrodyning crystals, crystal oscillator, v.f.o. variable capacitor, 9 mcs oscillator, balanced modulator. The 9 mcs oscillator crystals are located in front of the 9 mcs oscillator and cannot be seen due to the upper sub panel shelf.

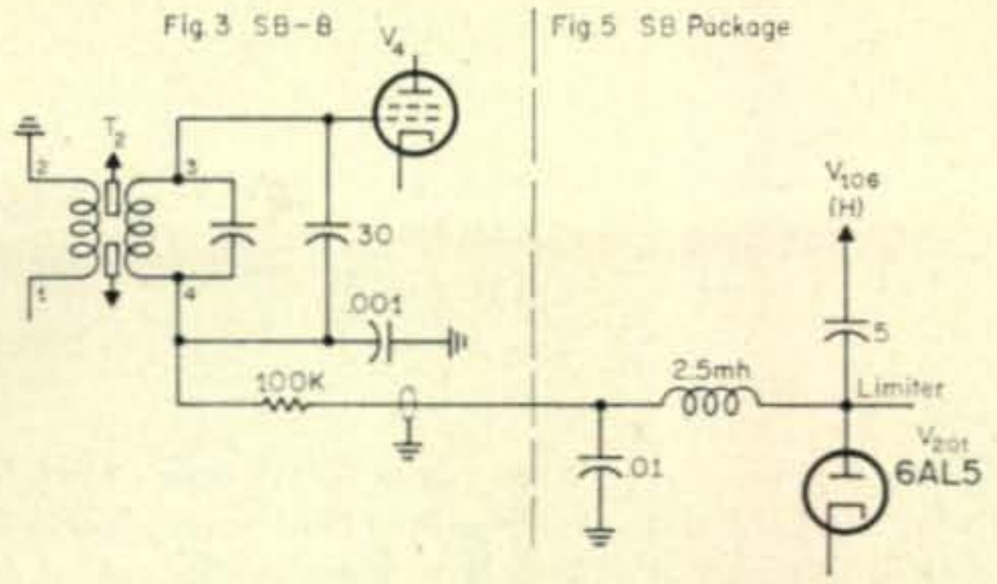


Fig. 4—A.l.c. mating of the SB-8 and the Sideband Package.

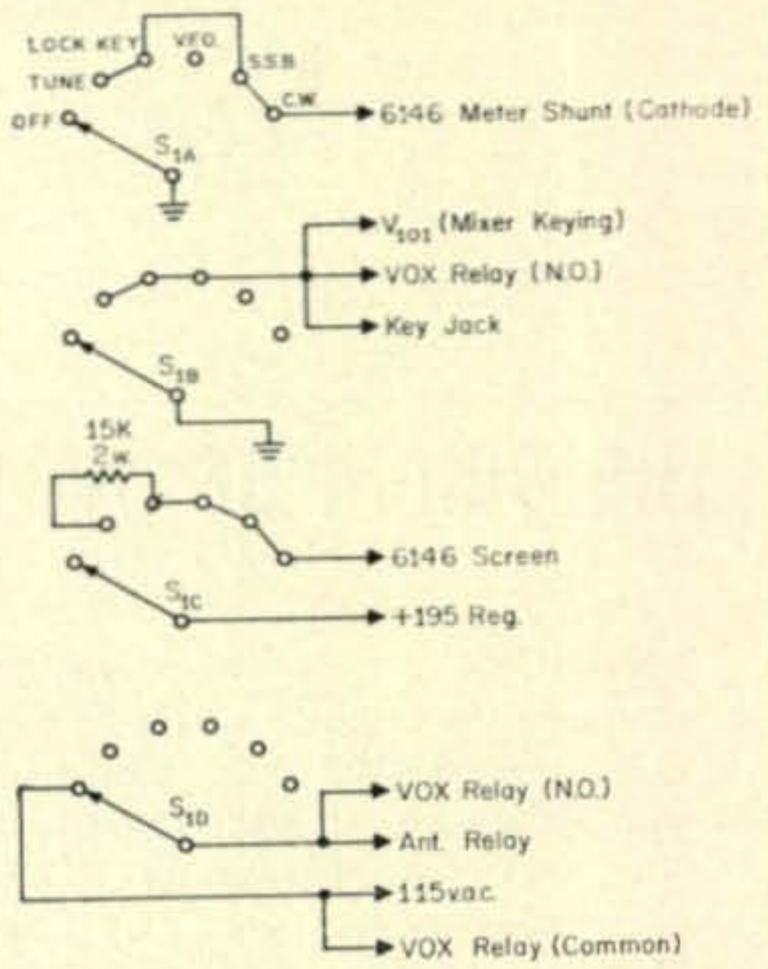


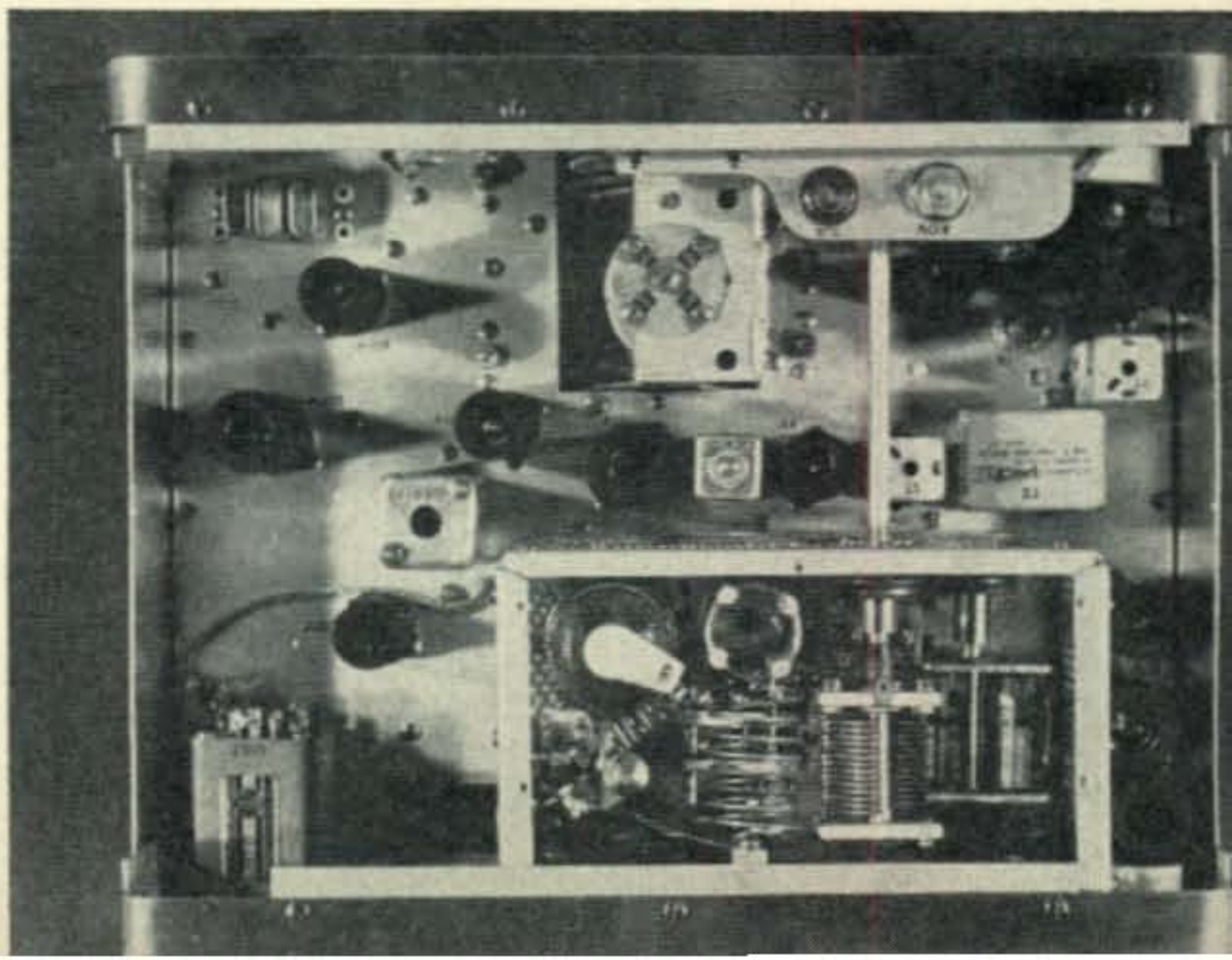
Fig. 5—Mode switch circuit of the KSSB-2. The vox relay is changed to a 4p4t as explained in the text.

7. The mode switch wiring of the Side-band Package was changed to allow a TUNE position with reduced screen voltage to the 6146 and also allow antenna relay operation when using the old a.m. rig. (See fig. 5.) The vox relay was replaced with a 4P4T obtained from Lafayette Radio for a pittance.

SB-8 Changes

Changes in the SB-8 were:

1. A decoupling network was added to the audio stage of the SB-8 to remove roughness in the note. The SB-8 audio was then coupled to the vox circuit of the Side-band Package. (See fig. 3.)



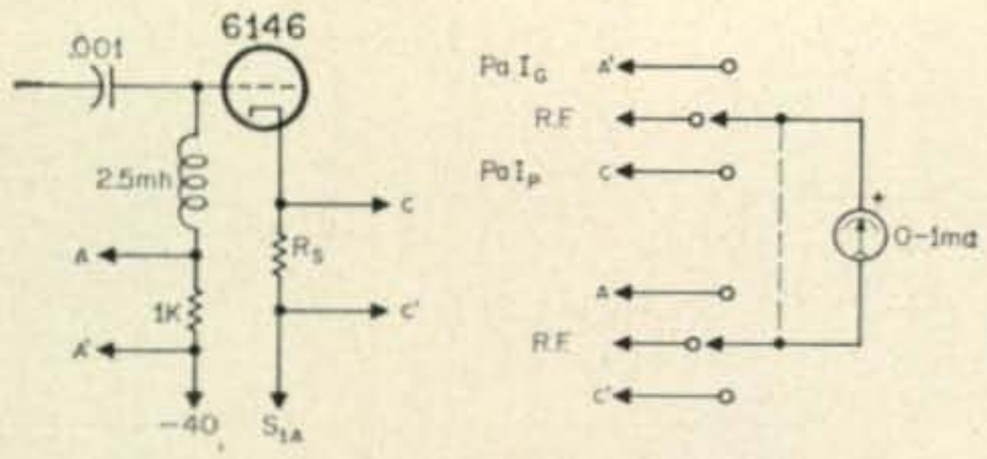


Fig. 6—Metering circuit for the KSSB-2. The r.f. circuit is the same as that of the SB-8. The meter shunt, *Rs*, value is dependent upon the internal resistance of the 0-1 ma meter.

2. ALC from the Side-band Package was adapted to the SB-8. (See fig. 4.)

The infant resembles a cousin from Iowa rather than Mother or Dad and is dippered in a homebrew cabinet 12½ × 5½ × 9 inches fashioned from aluminum cookie sheets. No power supply was included in the unit to eliminate possible heat build up and drift problems.

The photos show no 80 and 40 meter coils in the mixer and driver stages because no operation on these bands was anticipated. Room is available for the coils, however, without excessive crowding, for those who wish 80 and 40 meter operation.

Metering of the p.a. grid, p.a. plate and r.f. output was added for ease in tuning. Meter switching is accomplished by means of a 2p3t switch. (See fig. 6.)

After burping the newborn (de-bugging), on the air reports were very encouraging. V.f.o. drift was nill, carrier and unwanted side-band suppression was more than adequate and the audio quality was reported as excellent. With a well stocked junk box the entire unit represents a cash outlay of slightly less than $100.00.

Next project—shoes for the Kiddo!—(1 kw p.e.p.) ■

THE ORIGIN OF "WIRELESS TELEGRAPHY"

BY ED. MARRINER,* W6BLZ

I HAVE always been interested in the historical beginnings of Wireless telegraphy and many times have wondered when the name was first applied. Research at the library revealed before 1898, "Wireless Telegraphy" had been called, "Space Telegraphy," or "Hertzian Wave Signalling." After that date the name "Wireless Telegraphy" appeared often. I was getting close to my problem and scanned the pages more carefully and chanced upon a letter to a British magazine, *The Electrician* by a Mr. J. Munro dated 1898. The following is the context of the correspondence between the editor and Mr. J. Munro:

"Sir: "Wireless Telegraphy" is not a bad technical term, but if a more scientific name to be desirable would not Radio-Telegraphy or Ray Telegraphy be preferable to "Space Telegraphy," which Dr. Lodge employs in his interesting lectures?

"Perhaps someone will suggest a good term.

Yours, J. Munro
Jan. 15, 1898"

The idea was presented but the Editor did not get around to answering Mr. Munro's letter until May 13, 1898, when he had this to say:

"One of the minor difficulties connected with the development of that form of electric telegraphy in which the energy is propagated through non-conducting space is the choice of a *suitable name* by which to designate it. Popular custom seems to have fastened on the term "wireless telegraphy"; and so extensively has this name been adopted that, in spite of its manifest inaccuracy, its use by the electrical profession and press may, perhaps, be excused. It is scarcely necessary, however, to remark that in none of the systems of so-called wireless telegraphy as yet experimented upon are wires entirely dispensed with, while to those systems which depend upon electromagnetic induction a considerable length of extended wire is essential. But though this term has been generically applied to all forms of electric signalling without connecting wires, it is becoming more particularly used in connection with signalling by means of Hertzian waves. For this latter it might have been better, and it certainly would have been more in accord with the scientific conditions, had the term "Hertzian telegraphy" or wave telegraphy received the sanction of popular usage. But *vox pupuli* has decreed otherwise, and it is probable that the united protests of scientific professors and the electrical press would avail nothing to eradicate an already well established custom.

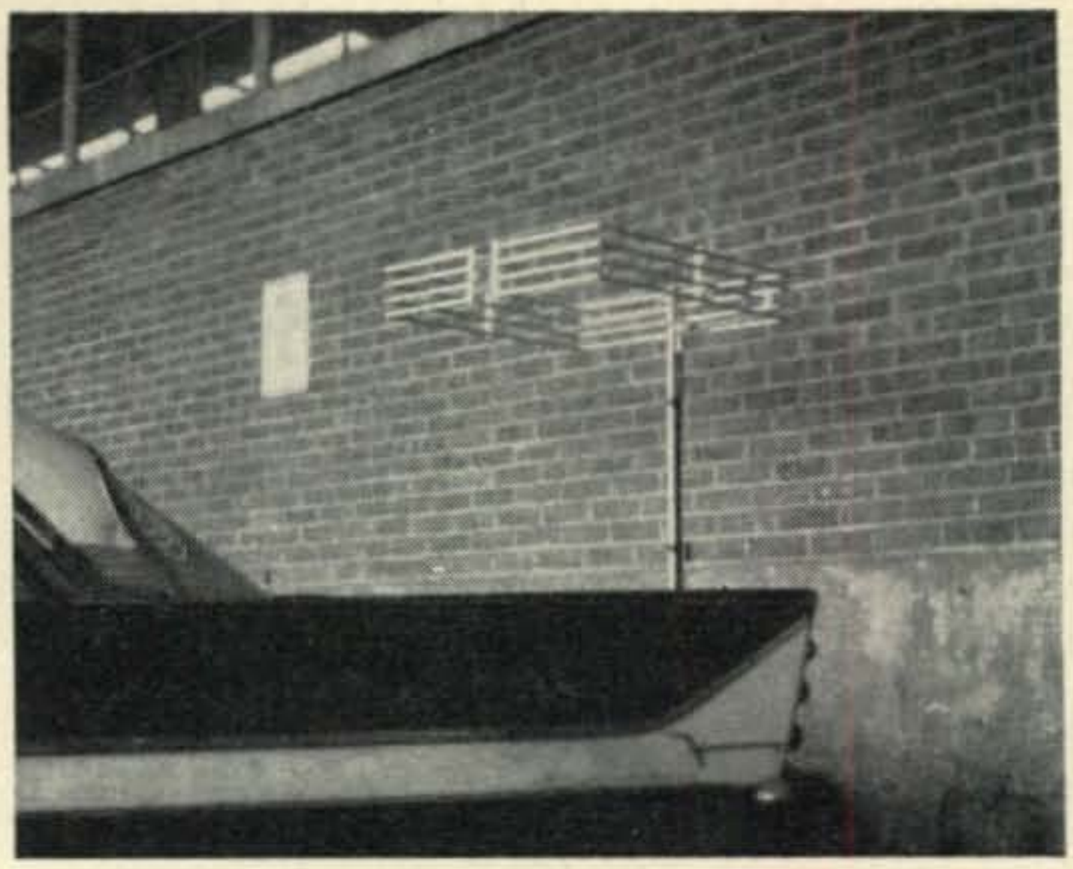
"It were, indeed, well for the science and practice of wireless telegraphy if the naming of it involved the only difficulty or even the most serious one. And it is chiefly to direct attention to one or two of the practical difficulties involved that we have turned to the subject at the present moment."

Thus with the sudden advance and development of wireless telegraphy during the following years, magazine articles became more numerous and the name "Wireless Telegraphy" with its publicity by the press stuck and became common usage.

It seems to me in the absence of the name before this date in magazines, and its common usage afterwards, that the letter sent into the editor by Mr. J. Munro might have had something to do with it. The name continued in use until the word RADIO became common. Strange to say, Mr. Munro also offered this word in the same letter but it did not take hold with the public. ■

*528 Colima Street, La Jolla, California.

View of the Four Square Six antenna mounted on the car.



A Four Square For Six Antenna

BY JESS DAUGHTREY,* K2EEM

This mobile antenna is only slightly larger than the average halo and has two advantages. First, it has a wider bandwidth and second, the square shape tends to merge with the car and thus be less obtrusive.

THE problem with most six meter halos is the limited frequency range that can be covered without the s.w.r. becoming objectionably high. The reason for this narrow bandwidth is rather simple. If a halo were cut, like a beam, to a half wavelength and folded into a circle it would have a probable diameter of 38 inches, much too large to mount on a car. The average halo is made smaller than a half wavelength with the result that it is self-resonant somewhere near 75 megacycles. When it is rolled into a loop and the ends brought close together it is capacitively loaded with large end discs to bring the frequency down into the 6 meter band.

The capacitive loading makes the antenna a very high *Q* device and consequently it is very critical of resonant frequency.

Harry Douglas, W2VRU, had the idea of making the antenna square which would reduce its physical size and still retain the omnidirectional characteristics of the round antennas. He is the one who designed and built the first "Four Square Six."

No matter how good a mobile antenna might be, it meets with two distinct disadvantages as compared with fixed station antennas. It has to work in close proximity to the ground and has to contend with the car body acting as a reflector. Harry first tried his idea in his lab on a three kmc, single element version. Then came the first six meter antenna, one of the elements of the Four Square Six. This antenna proved tremendously successful, and later the other elements were added to increase the capture ratio on receive, and also to reduce the I^2R losses during transmit. The gamma match was used rather than a matching coil so that all the elements could be connected to the mounting block for mechanical strength.

Test results with this little gem were very gratifying. With the antenna resonant at 50.5 megacycles, the maximum s.w.r. between 50.0 and 51.0 mc was 1.5 to 1. With so little activity at the higher frequencies, in the six meter band, we both decided upon 50.25 as an ideal center frequency. Even at this, I run about 1.6 to 1 at 50.8 mc, the AREC net frequency. The only comparisons that I am able to make are those made with the conventional halo that I formerly used. The halo was equipped with an impedance matching transformer and ran an s.w.r. of 1.1 to 1 at 50.25 megacycles, the resonant frequency. At 50.17 the s.w.r. was about 1.35 to 1 and at 50.3 it was 1.3 to 1. At 50.4 the s.w.r. was up to 2.0 to 1 and at 50.8, the AREC net frequency, it was 8.5 to 1.

*44 Fleetwood Avenue, Mt. Vernon, N. Y.

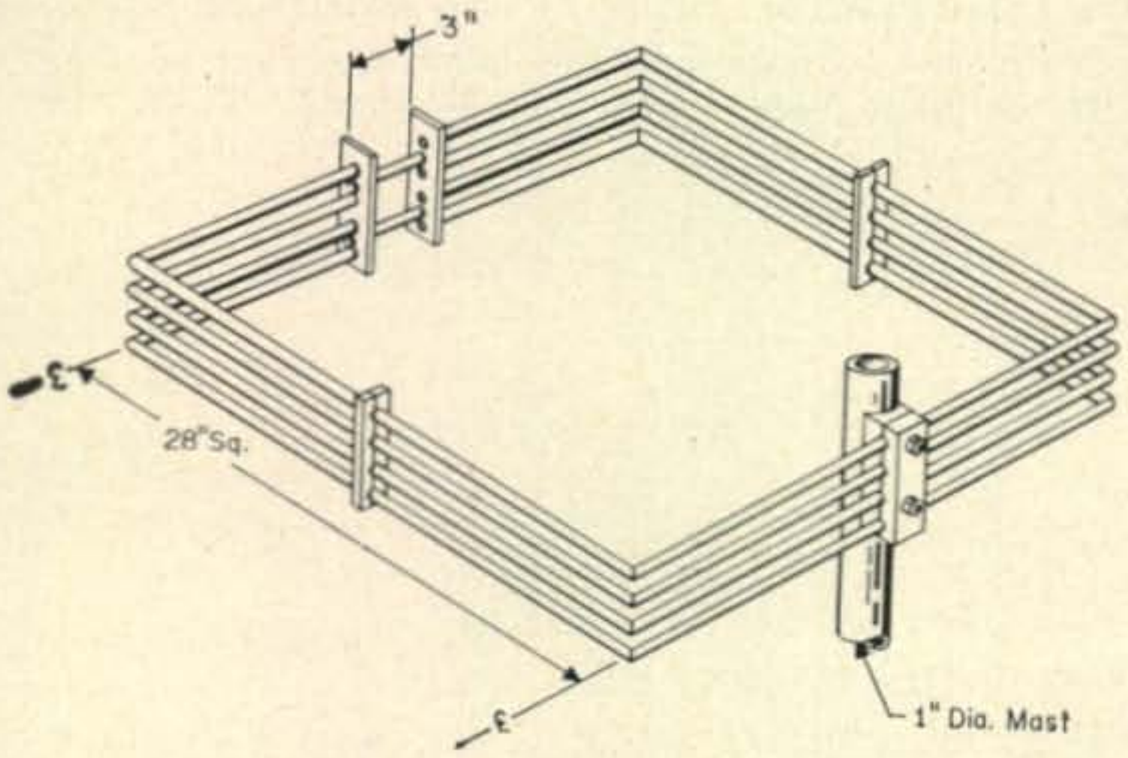
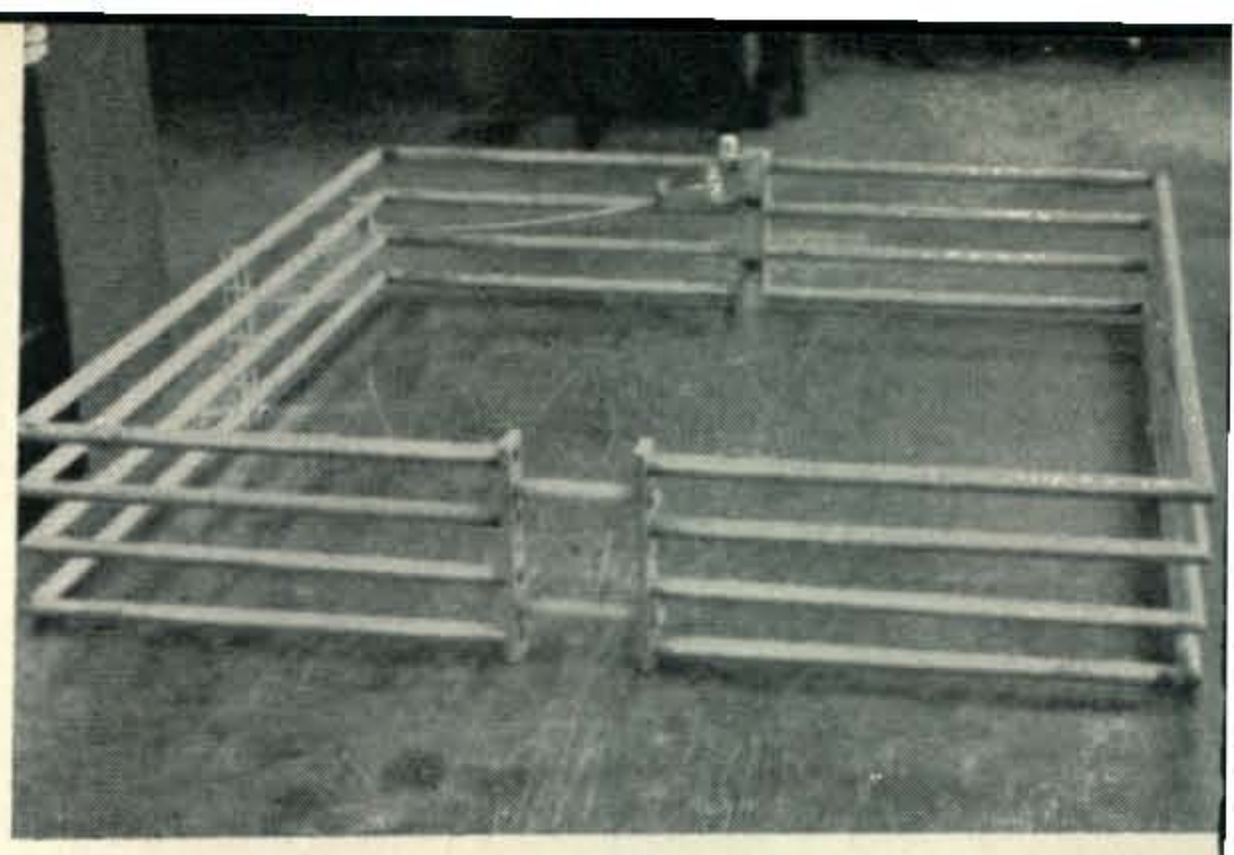


Fig. 1—The 6 meter mobile antenna is made from ½" o.d. 0.50 wall aluminum tubing (6016-T6), mitered and brazed at the corners. The measurements are 28" center line to center line or 28½" overall. The insulating material at the 3" gap is described in the text.

Advantages

There are a few other interesting advantages to the Four Square Six. When it would rain, the



The completely assembled antenna is now ready to be mounted on the car. The polystyrene side spacers are just visible.

s.w.r. of the halo at the resonant frequency, would increase to 3.0 to 1. This was because the rain between the capacitor plates would, in effect, make them closer together increasing the capacitance, and the resonant frequency of the antenna would be lower. The Four Square Six has almost no capacitance to vary, and the worst wet antenna s.w.r. value encountered was 1.3 to 1 at the resonant frequency.

There is a fast QSB experienced with the halo that is caused by the capacitor plates vibrating and varying capacitance. This is also eliminated with the Four Square Six.

I guess the most important reason for liking the Four Square Six better is that the XYL finds it less objectionable. She says, "Even though it is larger, it seems to blend in better with the lines of the car."

Construction

This is one project that I would suggest not to start without first recruiting the services of a machine shop. Someone who can do aluminum brazing is also a necessity.

The antenna is made from ½ inch o.d., .050 inch wall thickness, hard, (6061-T6) aluminum tubing. The antenna is 28 inches square "on the center line." When ordering the tubing, be sure to allow for the 28½ inch overall measurement. There will be twelve pieces 28½ inches long with both ends cut at a 45 degree angle. There will be eight pieces 12¾ inches long with the angle cut on one end only. Three long pieces and two short, then, are assembled, and brazed together to form one element. A simple brazing jig could be used to keep the elements uniform during brazing.

I recommend brazing rather than aluminum welding, because it has been my experience that welded aluminum is more likely to be weakened at the edges of the weld. This could cause the elements to break, eventually, at that point.

End Pieces

The end pieces which connect the ends of the elements are made from 1 inch wide aluminum strip ¼ inch thick and 5½ inches long. The holes for the elements are drilled through the bar and the set screw holes are drilled and tapped. Set screws were used because welding at this point would increase the probability of a break from the elements vibrating. I would suggest the use of stainless steel hardware throughout to prevent trouble later.

The ends of the elements are left open to reduce the area of the strips facing each other and thus decrease the capacitance between them.

The spacers for the gap are about ¾" in diameter and are made of either polystyrene, polyethelene or teflon. I used the polyethelene from the center of a piece of RG-94/AU coaxial cable.

Side Braces

The side braces are made from polystyrene sheet. I would suggest ⅜ or ½ inch thick. Mine is ¼ inch thick and should be stronger. I would not recommend lucite or plexiglass be used, because I feel they would have too high a loss at 50 megacycles.

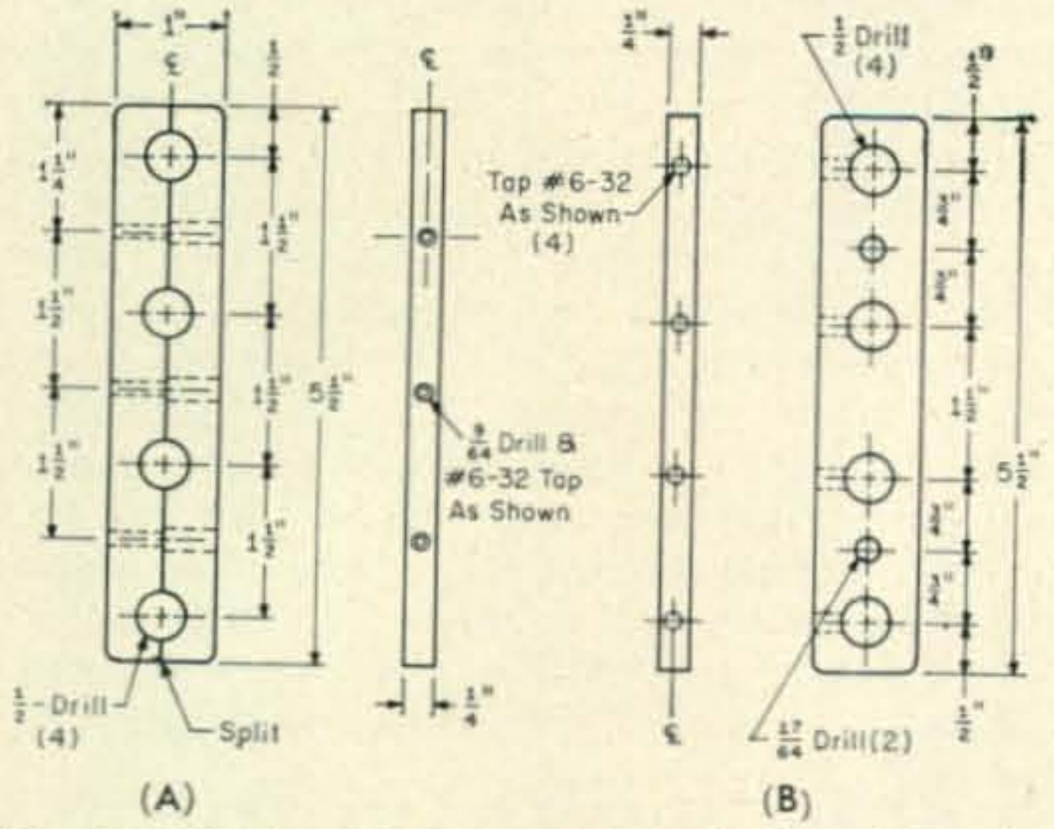


Fig. 2—(A)—The side braces are made from ¼" polystyrene. The clamping screws should be 6-32 nylon, (B)—the two end pieces are made from ¼" aluminum (6061-T6)

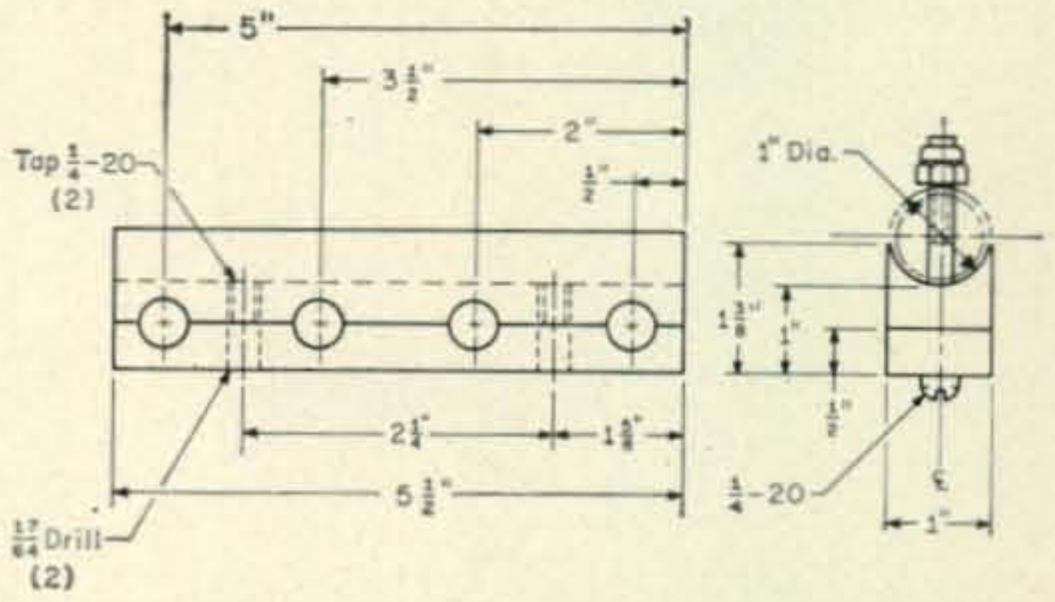


Fig. 3—Details of the mast clamp which is made of aluminum. The ¼-20 socket head screws are used to hold the mast to the clamp and are secured with elastic stop nuts.

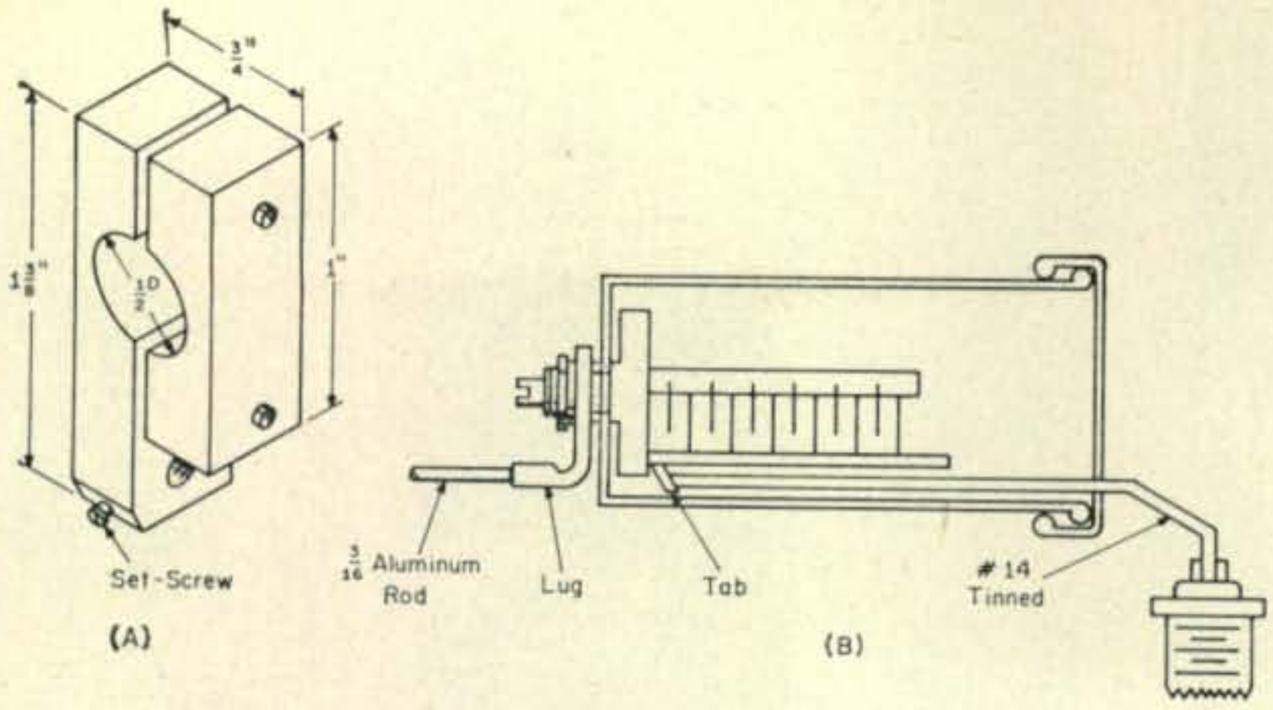


Fig. 4—The gamma match construction is shown above. (A) clamps on the side of the element as shown in the photos. (B) is the pill box housing for the gamma capacitor and (C) shows how the u.h.f. type connector is cut down. The remaining hole is enlarged for a #8 screw.

Mast Clamp

The mast clamp can be made from either a single piece of aluminum, drilled first and then split, or two separate pieces bolted together with a spacer between them while drilling the element holes, to insure a tight clamp on the elements. The radius to fit the mast must be made on a milling machine. This, to me, was the most difficult part of the job except possibly for the brazing of the elements. I would prescribe the use of a stronger mast than is normally used with halos, because this antenna is somewhat heavier. I used a stainless steel mast rather than a larger diameter aluminum job, thereby enabling the retention of the conventional size mast. This provides interchangeability with the halo. The decision of the mast diameter should preceed the milling operation of the mast clamp.

Gamma Match

For the gamma capacitor, a 30 mmf variable is used. A Johnson 30M8 or a Hammarlund MAC-30 is mounted in a pill box or capsule container of the kind you receive with prescriptions. A lug with a ¼ inch hole for the capacitor shaft mounting, is crimped to a 3/16 diameter aluminum rod, which is used for the gamma arm. A piece of #14 tinned copper wire is soldered to the stator of the capacitor and fed through a hole in the pill box cap. Keeping this lead as short as possible, for mechanical strength, it is then soldered to the modified u.h.f. connector.

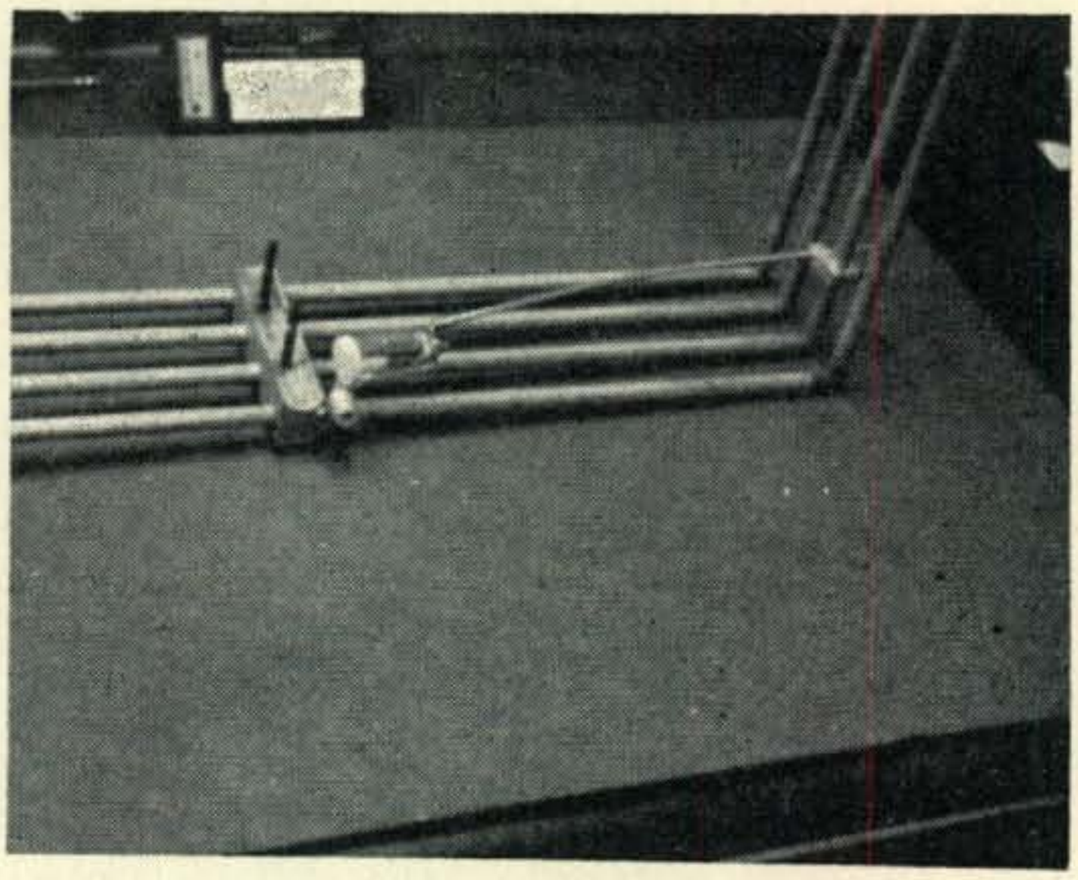
The gamma arm is connected, with the clamp, to one of the elements. Which element is loaded makes little difference. The point of match for the 52 ohm input, is on the side of the element about 2½ inches from the back of the antenna.

Adjustment

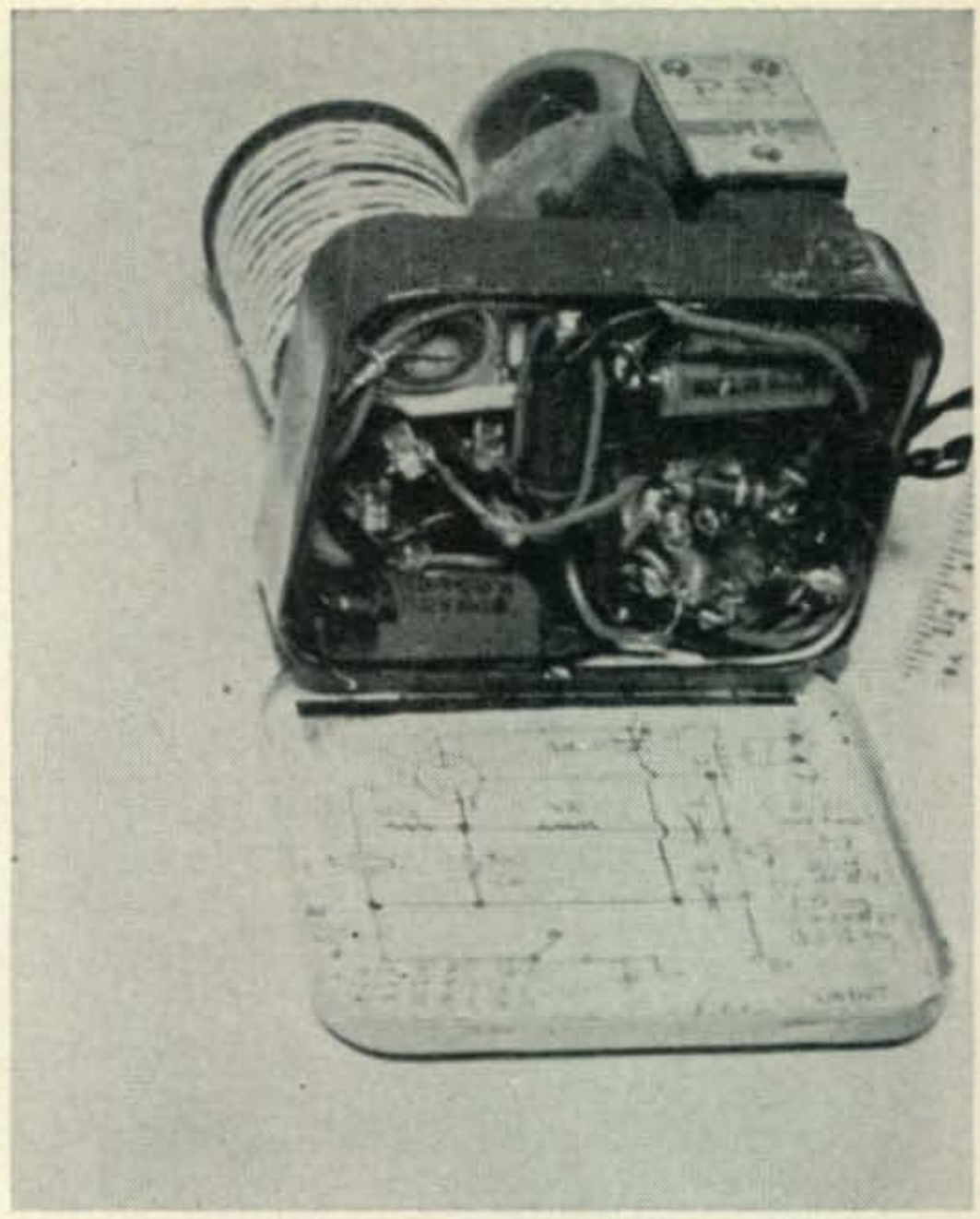
Adjustment of the Four Square Six is quite simple. The resonant frequency of the antenna can be checked by picking up the frequency of a grid dip meter on the receiver after dipping near one of the corners of the antenna. If the size of the antenna should vary and the resonant frequency be off, it can be shifted by changing the three inch space at the center. Bringing the plates closer together lowers the frequency. If the antenna measures 28 inches on the center line, this step will not be necessary.

The gamma arm is now installed as previously described. With the transmitter at the center of the desired range, the gamma capacitor is adjusted for minimum s.w.r. The clamp is then moved about ⅛ inch either way. The gamma capacitor is readjusted for minimum s.w.r. If this s.w.r. reading is lower than the previous minimum, you have gone the right way. If it is higher, then move the gamma clamp the other way and repeat the procedure. Keep moving the clamp an eighth of an inch at a time and adjusting the capacitor for minimum s.w.r., until you reach the lowest point, beyond which the s.w.r. would rise.

On the existing antennas this s.w.r. value is approximately 1.05 to 1. This would, of course, vary with the difference between the transmitter frequency and the actual resonant frequency of the antenna itself. These adjustments should be made with the antenna in position on the car and away from any other objects such as cars, trees or buildings. Be sure, also, not to have anyone standing near the antenna while the s.w.r. measurements are being taken. Any object in close proximity will have an effect on the tuning. This is the reason for my belief, that a mobile antenna should be as high and as far away from the car body as possible. I guess that mobile antenna positioning is a compromise between function and beauty, or rather disguise. In any case, where ever the antenna will be permanently, adjust it there and leave it alone. ■



View of the gamma assembly. The capacitor is in the plastic container and the cut down connector is secured to the mast clamp.



Top and bottom views of the one tube transmitter built into a Sucrets box. This makes it one of, if not the, smallest of its type.

The Simplest, Cheapest, Smallest Rig

BY J. DAVID RALSTON, S.J.,* WA9GRK

I was fascinated by the "Simplest and Cheapest Rig" appearing in *CQ*, August, 1963.[1] From the minute I finished the article, I just knew I had to build it.

Double Incentive

Two things especially drove me on. First of all, being a natural skeptic about such things, I just couldn't believe that a circuit this simple could really put out a signal. I had to prove it for myself.

Secondly, after studying the pictures, I decided that besides being the simplest and cheapest rig, this had a real possibility of being the smallest rig as well. With all that extra space and a few contemplated adaptions in mind, the miniaturization possibilities really had me excited.

Sucrets Chassis

I had always had my eyes on a couple tin Sucrets (throat lozenges, available at any drug store) boxes I had lying around. Here I thought was the perfect chassis for my tiny tyke. So to the challenge of building my first transmitter was added the extra challenge: will it all fit into the Sucrets box?

Construction Hints

Well, happily it did fit and with hardly room for a half-watt resistor to spare. The pictures tell the story better than I can. The only critical change was the employment of a smaller crystal socket, which was available in the junk box (where, of course, all the parts came from). Power connector and key jack were made outrigger (a wee bit of cheating) and connected to the transmitter by short wires. Because of the close quarters, a little extra care must be taken to see that all open leads are well separated from other leads and metal parts to avoid shorts or arcing. A coat of paint added the finishing touch.

Operation

The 6L6 was employed, running cool. A 7½ watt light bulb was used as a dummy load for tuning (filament glows when in tune). Best DX was over 600 miles using only a simple 40 meter dipole.

It is hoped the pictures will give some idea how it can be done. Add a little ingenuity to a Sucrets box and a few parts and you too can be the proud owner of the world's simplest, cheapest, and smallest rig. ■

*Bellarmine School of Theology, 230 South Lincoln Way, North Aurora, Illinois 60542.

[1]Geiser, D. T., "The Simplest and Cheapest Rig," *CQ*, Aug. 1963, p. 24. Correction, Sept. 1963, p. 84.

Putting the R-19/TRC-1 on 6 Meters

BY GEORGE P. OBERTO,* K4GRY

The modifications required to put this surplus receiver on 6 are minimal. Remove some tubes, modify two transformers, plug in the correct crystal and your on 6—crystal controlled.

THE R-19/TRC-1 f.m. receiver is designed to cover the 70 to 100 mc band. Needing a good receiver for a 6 meter net this surplus unit was carefully investigated. It was found that the first i.f. amplifier feeding the second mixer was close to the six meter band thus making the conversion easy.

The general layout of the unit is shown in fig. 1 and by following it no schematic diagram will be needed. However, those of you who are more fortunate may find a circuit pasted to the bottom plate of the receiver.

Begin by permanently removing the first and second r.f. ampliifiers, V_{101}, 6AC7 and V_{102} 6SH7. Also remove the first mixer, V_{103}, a 6SH7.

Next, remove T_{104} and T_{105} and take one turn off the top of each coil. Now, wind a 3 turn link, using #20 hookup wire, on the cold end (bottom) of T_{104} as shown in fig. 2. Remount T_{104} and T_{105} and wire them back into the circuit. Ground the cold end of the link on T_{104} and connect the hot end to the antenna terminal. Remove all other wires from the antenna connector and

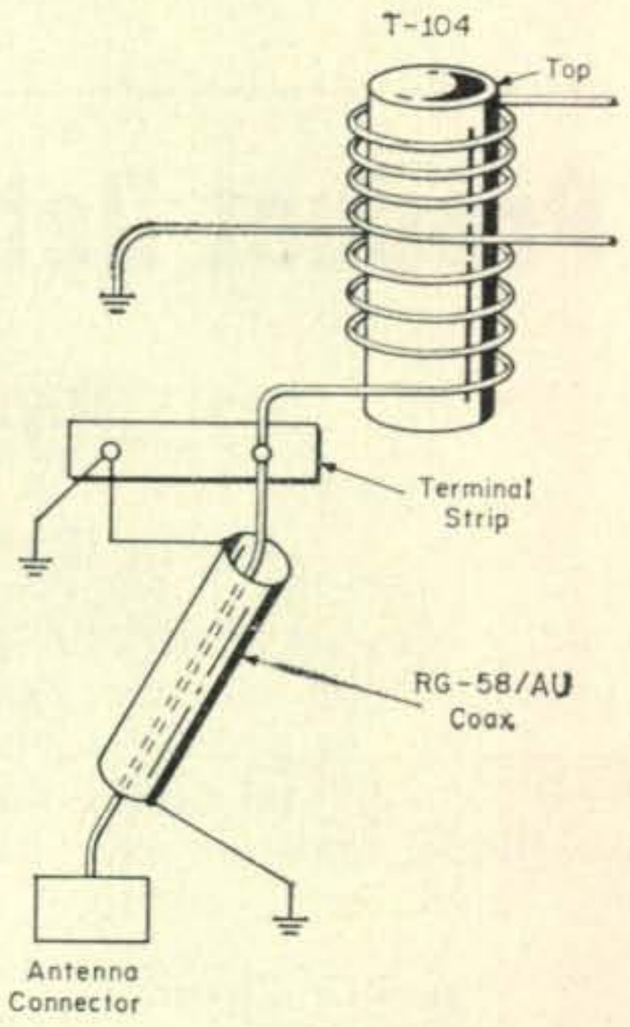


Fig. 2—Modification to T_{104} of the R19/TRC-1 receiver consists of the removal of 1 turn from the top of the existing winding and the addition of the 3 turn link on the bottom.

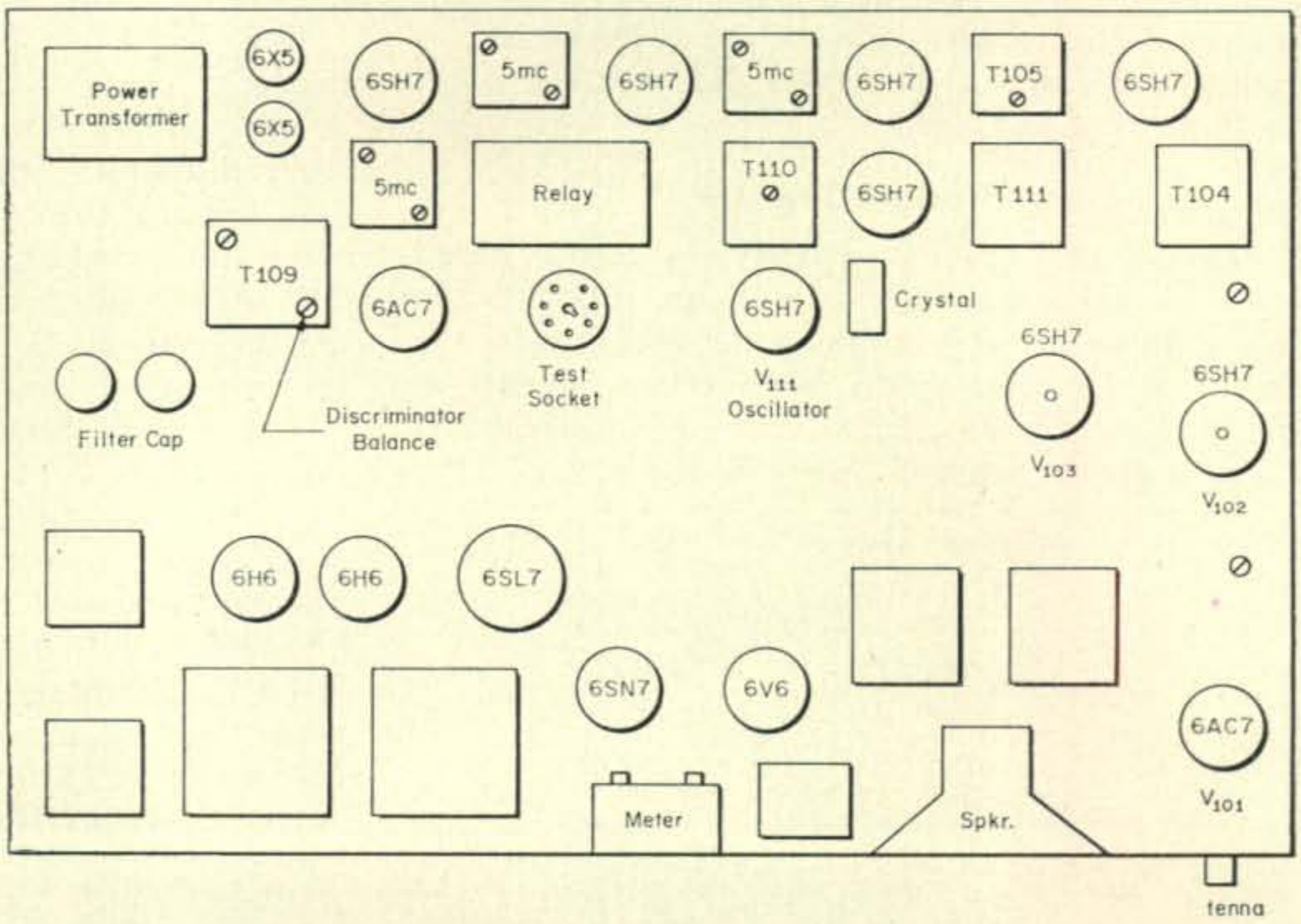


Fig. 1—Layout of the R-19/TRC-1 receiver that can be converted to 6 meter crystal controlled operation.

*6731 Patterson Avenue, Richmond, Virginia.

use a length of RG-58/AU between the connector and a terminal strip placed near T_{104}.

Crystal Frequency

The received frequency is determined by the crystal used in V_{111}, the oscillator. It was designed for FT-243 type crystals at 0.005% tolerance or better. The crystal frequency for receiving 52.525 mc is 9505 kc and 9520 kc for 52.6 mc. To calculate the crystal needed for any desired frequency procede as follows: Substract 5 mc (the i.f.) from a typical desired frequency, 52.640 mc, for example. The result, 47.640, is then divided by 5 to determine the crystal frequency. 47.60/5=9.528 mc.

Tuning

With the desired crystal plugged in we are ready to tune up the receiver. The tuning meter switch positions are: 1 and 2–first limiter, 3–second limiter, 4 and 5–discriminator balance and 6–audio line.

Set the meter switch to position 3. Feed the output of a signal generator or connect our transmitter up to a dummy load that is not too well shielded and peak T_{110}, T_{111}, T_{104} and T_{105} for maximum second limiter current as shown on the meter. Next, switch the meter to position 2 and repeak for maximum first limiter current. Get a local to come on and repeak T_{104} and switch over to position 4 and 5 and balance the discriminator adjustment for a zero reading. (See fig. 1 for the T_{109} balance adjustment.)

The receiver can just as easily be used to copy frequencies below the 6 meter band, say police, fire, CAP, MARS, or what have you by leaving T_{104} and T_{105} as is and wind the link around T_{104} and then figuring out the crystal frequency as explained. ■

A Product Detector For the Super Pro

BY RALPH SAROYAN, *W6JPU

HAVE you retired that Super Pro because it couldn't copy s.s.b.? Drag it back out of the garage because here is a simple product detector that can be added without drilling a single hole. It shouldn't take more than an hour to complete and it makes an excellent c.w. and s.s.b. receiver out of the Super Pro.

A.V.C. Circuit

First remove V_{12}, the 6H6 a.v.c. rectifier and retire it or keep it for a spare. Remove the leads that connect the paralleled plates and cathodes and connect them to a good quality silicon diode with a high front to back resistance. The diode may be mounted on a tie point secured to the rear flange of the chassis. Check the receiver at this point and you will find, as I did, that the a.v.c. action is just as good.

Product Detector

Round up a 6SL7 tube. (My choice was based on junk box availability.) Insert this tube into the old 6H6 socket and ground pin 8 to complete the filament circuit. Wire the circuit as shown in fig. 1. Run the 100 K resistor to the nearest 250 volt tie point. You can recognize this point by the several red wires soldered to it.

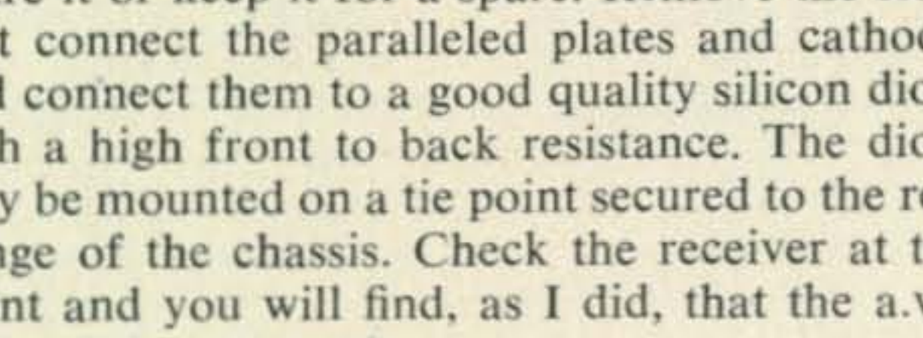


Fig. 1—Circuit of a simple product detector that can be added to the Super-Pro to equip it for s.s.b. reception.

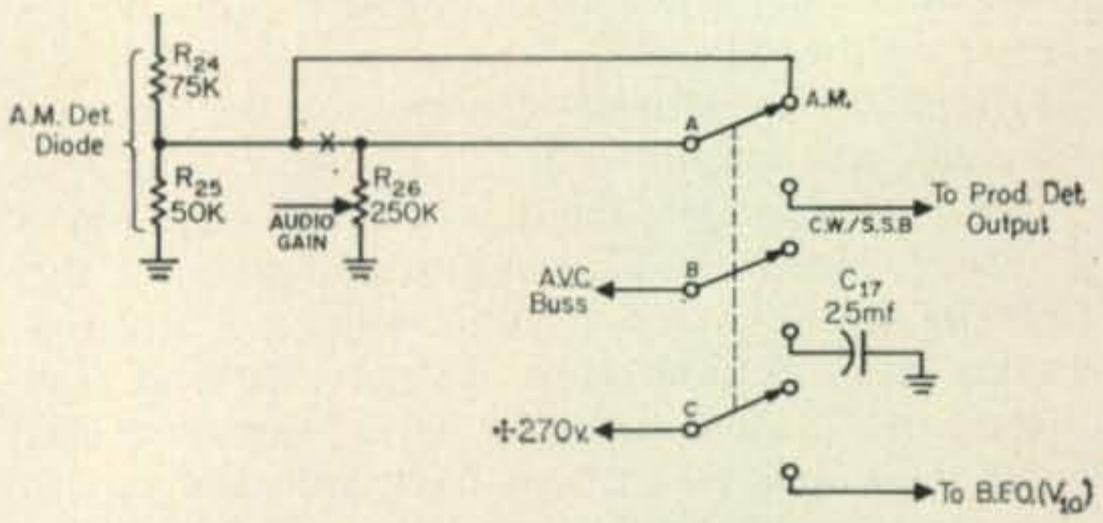


Fig. 2—The MOD-CW switch may be replaced by the 3 pole d.t. switch as shown above. The sections A and B replace the old switch wiring (S_3) and section C switches the audio between the two detector circuits.

Now remove the shielded wire from pin 8 of the b.f.o. (V_{10}, 6SJ7), add a 3" length of wire to it and connect it to pin 4 of the 6SL7. This ties the input of the third i.f. stage to the product detector and the 5 mmf coupling capacitor (located in the 3rd i.f. can) is adequate coupling. A 0.01 mf ceramic coupling capacitor from pin 8 of the b.f.o. to pin 6 of the 6SL7 ties the b.f.o. to the product detector.

The output shown in fig. 1 is fed to the high side of the volume control after removing the feed from the diode detector. This arrangement makes the reception of a.m. signals very difficult. The MOD-CW switch may then be replaced by a 3 pole d.t. unit wired as shown in fig. 2.

There are many other ways of improving the Super Pro that are beyond the scope of this simple article. You might, if you are ambitious, look into W6FHB's article[1]. ■

*6204 Townsend Ave., Fresno, California.

[1]Reed, C. E., "The Ultimate Conversion of the Super-Pro Receiver," *CQ*, April 1961, pg. 38.

HIGH POWER

V.H.F./U.H.F. DUMMY LOADS

BY WILLIAM J. La HIFF,* W2IVT

Suitable dummy loads in the v.h.f. and u.h.f. bands are frequently a problem. While low wattage units are available, the high wattage units are costly. The use of a specific length of coaxial cable with a low power dummy load permits the use of low power loads at higher power levels.

CONSIDERABLE thought has been given to the requirement for a good dummy load which will handle a reasonable amount of power for testing high power v.h.f. and u.h.f. amplifiers. Several companies offer loads which are suitable but they are priced too high for amateur use. The loads available at reasonable prices are not adequate in that they will not handle high power and the s.w.r. exhibited at 432 megacycles is excessive.

The inherent power loss of type RG-8/U and RG-58/U coaxial cables and other similar types, while deplorable when these cables are used for antenna feeding, can be utilized profitably when it is desired to assemble a dummy load for use at 50 megacycles and up. A suitable length of coaxial cable can be used with a low power dummy load for testing high power amplifiers. Also, the attenuation of the cable will serve to nullify the reactance exhibited by the dummy load termination with the result that the assembly will serve as an excellent dummy load at frequencies to 1300 megacycles.

Investigations

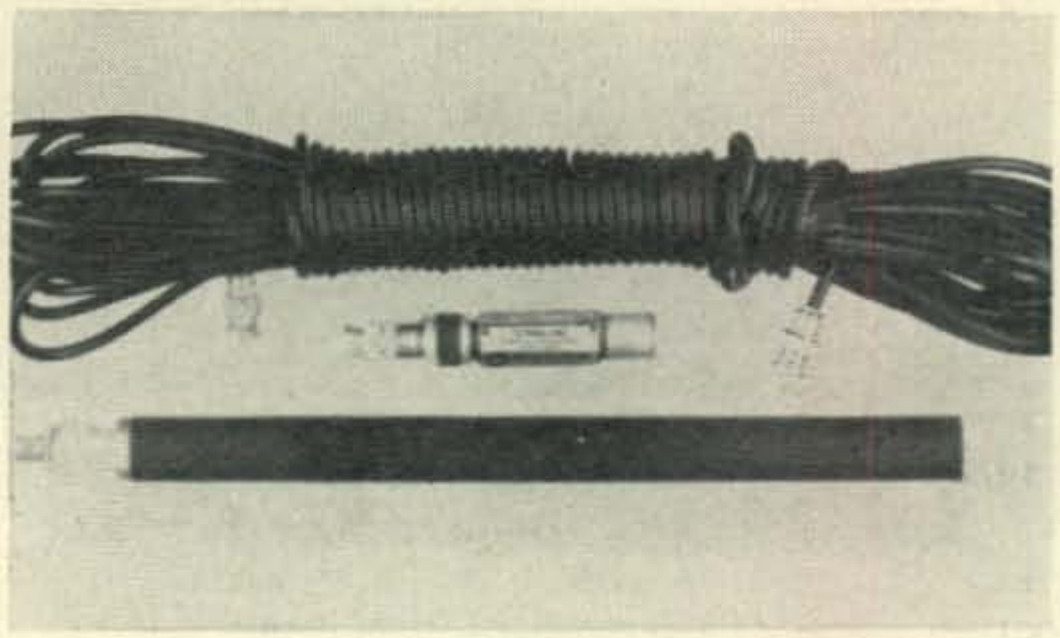
The table, fig. 1, was made up from manufacturers specifications for the RG-58/U and RG-8/U type coaxial cables and indicates the loss for 100 foot lengths, in both decibels and ratio, at 144, 220 and 432 megacycles. As will be noted, a power loss of 3.4 decibels or a ratio of 2.1 can be expected when a 100 foot length of RG-8/U cable is employed at 220 megacycles. Thus a termination capable of dissipating 100 watts may be employed with a 100 foot length of RG-8/U cable to test a 210 watt output transmitter. However, this is only true when the termination used has low reactance and exhibits a low s.w.r.

The loss in coaxial cable is caused by the *IR* loss of the inner and outer conductors and the loss due to heating of the dielectric, with the greater percentage of the loss incurred through the latter. When the coaxial cable is terminated in a load which does not perfectly match the characteristic impedance of the cable voltage variations occur along the length of the cable and dielectric heating is greatest where the voltage is highest. This heating results in larger power losses in the cable, as indicated in fig. 2. If, as in the previous example, the length of cable used at 220 megacycles has a power loss

*c/o Kahn Research Laboratories Inc., 81 South Bergen Place, Freeport, N.Y.

Freq.	RG-8/U loss, db.	Ratio	RG-58/U loss, db.	Ratio
144 mc	2.5	1.7	5.2	3.2
220 mc	3.4	2.1	6.8	5.4
432 mc	5.0	3.0	10.0	10.0

Fig. 1—Loss of coaxial cable of 100 foot lengths when terminated in a matched load.



Necessary ingredients for high power dummy loads at 144 mc and higher are shown above. In the foreground is a Carborundum HL-CC-1, rated at 100 watts continuous or 250 watts intermittent. Above it is the Bird 80M termination rated at 5 watts continuous. Also shown is the 60 foot length of RG-58/U cable used in the tests. Photo by Bob Walsh.

Cable Loss with Matched Load, db	Load s.w.r.	Add s.w.r.	Total Loss, db.
2.5	2	0.36	2.86
2.5	3	0.9	3.4
2.5	4	1.4	3.9
3.4	2	0.4	3.8
3.4	3	1.0	4.4
3.4	4	1.7	5.1
5.1	2	0.45	5.55
5.1	3	1.2	6.3
5.1	4	1.8	6.9
6.8	2	0.48	7.28
6.8	3	1.3	8.1
6.8	4	1.8	8.6
10.0	2	0.51	10.51
10.0	3	1.3	11.3
10.0	4	1.9	11.9

Fig. 2—Chart above shows the additional loss of coaxial cable when operated into a mismatched load.

of 3.4 decibels and this cable is terminated in a load which exhibits an s.w.r. of 4, an additional loss of 1.7 decibels will occur within the cable for a total of 5.1 decibels. (ratio approximately 3) power loss. Consequently, the 100 watt termination could be used for testing a 300 watt transmitter.

This last would seem to indicate that the termination should be the worst possible, resulting in a shorter length of cable for a given attenuation and anyone can make a rotten load. This is so, to a degree. However, the power must go somewhere and an attempt to use too short a cable can result in a big blob of polyethylene.

As in everything else we must be moderate and select a good compromise. I estimate that for measurement of power in the order of 300 to 500 watts a maximum termination s.w.r. of 3 is permissible with RG-58/U cable and a maximum of 5 with RG-8/U cable at 144 megacycles. These are estimates because, as far as can be determined, information for operation of coaxial cable in this manner is not available.

Test Equipments

The terminations available to me happen to be rather good types. On hand is a Bird model 80M which is rated at 5 watts continuous operation and operates with a low s.w.r. to 4000 megacycles. This load shows zero reflected power at 144 and 432 megacycles. I have operated it at powers of 10 to 12 watts for considerable lengths of time without apparent damage. Also available is a Carborundum Co. type HL-CC-1, which is rated at 100 watts continuous duty operation and 250 watts for intermittent use. The s.w.r. is rated good to 144 megacycles. This load is designed for amateur use and sells for less than $13.00.

A Bird model 43 Thruline wattmeter was borrowed for the tests and a well used 60 foot length of RG-58/U cable was selected as the specimen.

144 Megacycle Test

A test set-up as in fig. 3(A) was made up to check the s.w.r. of the HL-CC-1 load at 144 megacycles. The s.w.r. proved to be 1.9 and within the manufacturers specifications. The coaxial cable was then inserted in the set up as in fig. 3(B). The s.w.r. measured less than 1.5, indicating an improvement in the reactance shown to the transmitter.

The cable was then inserted in the test set-up shown in fig. 3C and the power indicated was recorded. Note that in this case the Bird termination was used. A load with even a relatively small reactance would affect the accuracy of this test rather seriously. The coaxial cable was then removed from the set-up and the wattmeter connected directly to the transmitter. The new power recorded indicated an approximate 50% loss in the coaxial cable.

The remaining consideration is the ability of the coaxial cable to dissipate 100 watts continuously or 250 watts on an intermittent basis. Tests were conducted with 400 watts of 144 megacycle power applied to the load assembly for 15 minute periods. The cable became warm, but to my surprise not to the degree expected. Longer tests would have been conducted excepting that Jerry, W2LVQ objected. The test was conducted using his transmitter and he was afraid he might lose his 4X250B's with this type of key down operation.

Thus the 60 foot length of RG-58/U cable when assembled with the HL-CC-1 termination could be used as an effective low reactance dummy load at 144 megacycles for 200 watt continuous duty or 500 watt intermittent operation. The additional loss due to termination s.w.r. is ignored because it amounts to only an approximate 0.4 decibels.

432 Megacycle Test

Tests were conducted at 432 megacycles using the procedures previously outlined. The HL-CC-1 load measured an s.w.r. of 3.9. When the 60 foot length of cable was inserted (fig. 3B) the wattmeter read zero reflected power, an excellent load at this frequency. The measured loss was

[*Continued on page 104*]

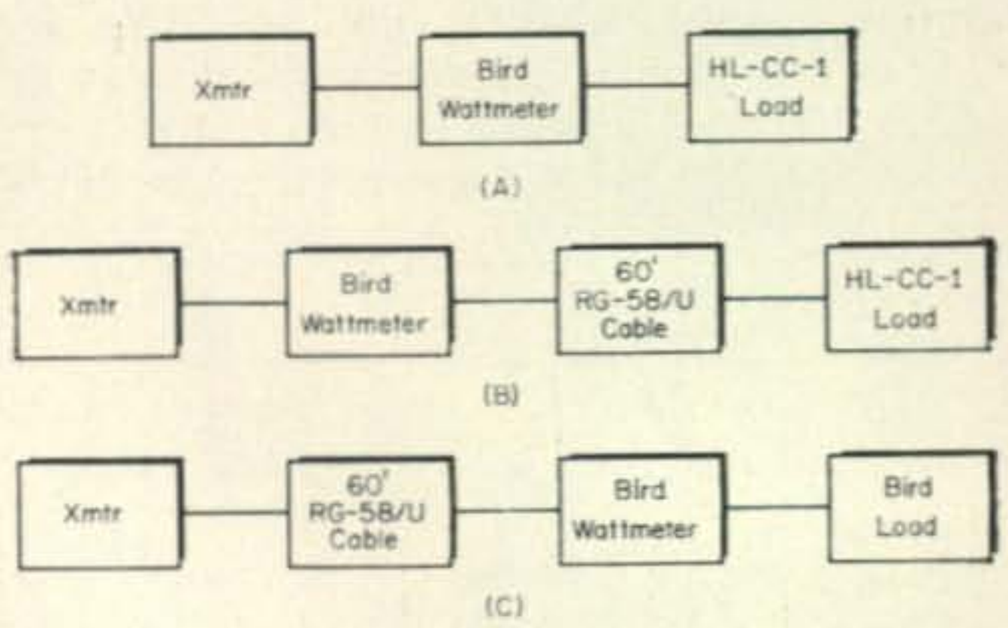


Fig. 3—(A) Test set up for determining the s.w.r. of the HL-CC-1 load at 144 mc. (B) This test set up includes the 60 foot length of RG-58/U and showed a reduced s.w.r. (C) Set up used to measure the loss introduced by the insertion of the cable.

FCC DOCKET 15928: HOW DO YOU REACT?

BY HOWARD S. PYLE*, W7OE

These are the results of a one man poll taken on the air, by mail, and through meetings by the author.

EARLY in April I received a copy of the FCC proposal (Docket 15928) which constitutes their proposed solution to the 'incentive licensing' situation. This included distinctive call letters and other related matters in the amateur field which they have held in abeyance for sometime. By now you have all become familiar with this proposal and have had an opportunity to discuss it, think it over and, if you felt warranted, *do* something about it in the way of comment and/or protest to FCC.

After studying the proposal rather thoroughly, I decided to see what I could garner in the way of general reaction in the active ham field; I went on the air with that in mind. For about the first ten days after release of the proposal it appeared that very few hams had as yet seen a copy. At that time it had not of course had an opportunity to appear in the amateur journals and my initial questions beginning with, "What do you think of the FCC answer to the incentive licensing proposition?" met, in almost all instances, a counter-question; "What is it? What does it provide?". So, maybe an hour was spent with each contact giving him a synopsis and, followed by discussions which were often rather lengthy. Break-ins were rather frequent; some one who had been 'reading the mail' and wanted in on the discussion. I could see that such time-consuming two-way contacts weren't going to get me very much of an overall picture of ham reaction. I decided to operate instead as a 'listening post' picking out only those stations whom I heard discussing the proposal, gathering a little meat from each. I also took time to talk face-to-face with a considerable number of local hams and wrote a bunch of letters to more distant friends in the fraternity.

I started this 'one man poll' on April 20th and continued my listening periods whenever time permitted, averaging about four hours a day, right through April 30th. The comments which I heard, while necessarily not large in point of numbers considering our more than a quarter million licensed hams, were nonetheless enlightening. On the air I contacted only 36 stations and, as I mentioned previously, relatively few were then familiar with the FCC proposal. I talked face-to-face with 17 local hams and wrote to 16 others, receiving replies from eleven to date. From April 20th to 30th inclusive, I listened and made notes from the comments of 147 others who were definitely discussing the subject I was 'tailing'. These embraced 7 of the 10 US call districts plus 3 Alaskan stations; I heard no discussions from the Hawaiian group.

The 20, 40 and 80 meter bands were exclusively covered.

*3434-74th Ave., S.E., Mercer Island, Washington, 98040.

The Inquiring Fotographer

By H. S. PYLE

THE QUESTION

What is your reaction to Docket 15928?

Ed Extra: "I guess I'm sitting pretty, I stand to gain a lot without losing anything. Some of us in the Extra class are concerned about a change in their call, as they got their ticket after 1932."

Al Advanced: "I don't like losing my old call and my favorite frequencies too. Most of all I resent being demoted and penalized down to a General class license."

George General: "I don't like any of it. I don't like the change of call, the change in frequencies or the whole setup."

Ted Technician: "Oh well, it's not too bad, just a little call letter juggling. The frequency changes aren't that severe, just means a few new crystals. I'd rather keep my old call tho'."

Ned Novice: "The proposed extension doesn't really affect me, and my call is not that old for me to really complain. I can get the phone privileges back as a general."

15 meters, when alive, was pretty much enmeshed in DX contacts so I ignored that band; six I skipped as I pretty much had the local reactions on 40 and 80 and in face-to-face contact. I tried too, with some measure of success, to stay with those I heard long enough to develop a clue to their ages and class of license held. Many for example would say, "Well OB, I dunno just how to take it. I've held my *General* ticket for a lot of years with the same call; I'd hate to lose it . . . etc.". I pegged him then as a 'General' and of a mature age. The age angle in many cases, was a bit more difficult to ferret out but, in the novice class particularly, the younger element were pretty well identified through their discussions of school work and similar chit-chat. Even some of the oldsters in the novice group would drop an age clue such as ". . . took up ham radio for relaxation from my legal practice"; obviously not a youngster! So, playing "Dick Tracy" on the ham bands gave me a fair, though admittedly small cross-section of ham reactions to the new proposals. Now, with my log and notes before me, let me show you what this little thumb-nail picture developed.

Of the Extra class group, I was able to definitely identify five. Three of these expressed themselves as not particularly concerned in that their call letters (like my own) coincidentally fell within the groups to be assigned (if the new proposal carries) a single letter prefix 'W', call area figure and two letter suffix. All three had apparently held a US amateur station license prior to July 1, 1932. They had nothing to lose but would *gain* some exclusive frequency assignments. The other two apparently did not have long enough beards to qualify for a single letter prefix in their call, as they mumbled a bit about the proposed call letter change to *two* prefix letters. I didn't concern myself much with 'age' in the Extra class group as rarely will a juvenile be found among these patriarchs.

I caught only a few of the Advanced class whom I could identify as such; these however all appeared to be mature which obviously they would be with no new Advanced class tickets having been issued for several years. They were unanimously resentful on one point however, seeming to feel that they are being penalized, as I guess they are; losing status in being "demoted" as they put it, to General class. Call letter change of course was as disturbing to them as to other classes.

From the General class group whom I could identify as such and who were, of course, in the largest majority, the average age from the 67 to whom I could approximately tie it, figured to be 29 years. I caught one at 15, representing the youngest and a 'Senior Citizen' of 68 topped the upper end of my list. At an average age of 29 this represents a pretty mature group with good thinking capability. Expressions of opinion were pretty well confined to the two major issues which the proposal represents to them; change of call letter assignments and loss of some frequency segments to Extra and First class licensees. Naturally, their comments were practically unanimously in the way of protest; they don't like it. I did hear a few though who did not appear particularly concerned; one fellow put it, ". . . I always did hate the lousy call letters they handed me anyway; any change would be an improvement!". Two others were heard to say in effect that loss of some frequency spectrums didn't worry them; they didn't work those frequencies anyway!

Practically all of the 33 Novices I copied seemed to be a bit confused. They had confidently expected to retain their call letters simply dropping the 'N' in the prefix when they became Generals. It appears from the proposal that this will continue to be the case *only* in the relatively few instances where dropping the 'N' from their prefix group will leave them with a call letter combination which co-incidentally will fall into the General class assignment *provided* that such call has not previously been assigned to a General class licensee. Novices actively on the air as licensed hams are understandably not interested in the extension of the Novice class license term to *two* years instead of one . . . too late to do them any good, as this is specifically stated in the proposed ruling to be available *only* to *new* holders of novice licenses. That is, only those who qualify for such license *after* the ruling, if adopted, becomes effective are affected. Loss of phone privileges did not seem to create much of a flurry in the novice ranks. As several put it, in effect, "Well it don't much matter to me . . it takes a lot of extra gear for that band and I'd rather wait until I'm a General and can use other phone bands". Let's say then that the licensed novice is not particularly interested in Docket 15928 then, other than a bit of resigned grumbling where a change in their call letters will occur.

Technicians I had to pass over; I have no equipment with which to cover their frequencies but as this is a relatively minor group and they apparently will suffer nothing other than a possible call letter change, a report on them would contribute nothing to this poll.

My face-to-face conversations on the subject with local hams of various license classes and age groups, produced just about parallel reactions to what I heard on the air. The eleven mail correspondents from whom I heard, came through in about the same way. All in all the whole operation presented a rather astounding similarity in the overall reaction of a small cross section of the ham field.

There you have it; the tidal wave of comment and protest is no doubt well into the full 'howling of the pack' by now and from where I sit, it looks like it will really *be* a howl! I can just imagine the automatic sorting machines and belt conveyors which FCC will have to add to their other 'mechanical brains' to wade through the mountainous heap of correspondence which 15928 will engender! That is, *'if'* . . . and that's a mighty *big* "IF". Those thousands of hams who

[*Continued on page 100*]

THE "ULTIMATE" QTH

BY WILLIAM J. FISHER,* W2MXJ

BILL Ham was having that intermittent arc-over trouble with his kw linear again. It was after 2 am but, tired as he was, Bill was determined to lick the problem once and for all. The last thing Bill remembered was checking the clearance around that r.f. choke feeding high voltage to the plates. A flash—and it was all over—this time Bill had forgotten to switch off the plate supply.

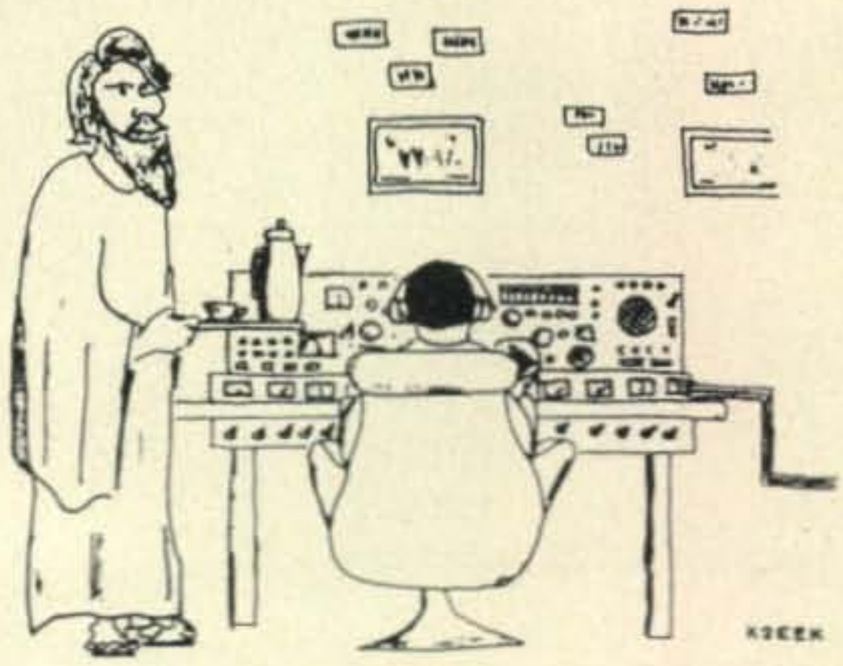
Almost immediately, it seemed to Bill, he found himself on what appeared to be a vast plain. Faint trails of mist seemed to rise from the ground about him; the playing of harps could be heard as from a great distance; and occasionally a chorus of soft voices wafted down from above. Then from out of the mists appeared a tall stranger, dressed in a long, loose-fitting white robe. The stranger appraised Bill for a moment before addressing him with a smile: "Welcome, Bill, we've been expecting you. Your operating position is ready." Bill could hardly believe it. He dared not think himself worthy of it. Yet all the signs pointed to the fact. Bill must have actually "made it." He must have arrived in Heaven.

The stranger, whom Bill regarded as the spiritual equivalent of Jeeves then ushered him into what looked like a sound-proofed broadcasting studio. In the center of a large, luxuriously carpeted room stood an enormous semi-circular console. And what a console. The panels were covered with rows of meters, various colored jeweled pilot lights, row upon row of switches and control knobs and an array of jacks and plugs. At each end was a speaker grill; on the desk a beautiful deluxe mike and, of course, a chrome-plated vibro-keyer. The panels were all laid out symmetrically with all controls within easy reach of the operating position.

"Jeeves" checked Bill out in the operation of the console, carefully explaining the function of each and every control. Bill learned, that, from the console position, he was able to operate a fabulous array of transmitters and receivers which were all remotely located at a one hundred acre antenna site. Every type of antenna imaginable was available for instant selection. Anything from a sixty foot parabolic dish on 1215 mc to a giant rhombic on 160. There were stacked beams galore and separate transmitters for every band; capable of all modes of operation and continuously variable in power input from ten watts to two kw p.e.p. The receivers, likewise, were remotely tunable. And what receivers. Their "specs" made the HRO-500 look like a two tube regen. This was truly a ham's paradise. You might even say it was "out of this world."

It didn't take Bill long to become familiar with the operation of the "dream" console. He had himself a ball. Receiving and transmitting conditions were always perfect. Not one tiny crack of QRN was ever heard. The receivers were so superbly selective, QRM was non-existent; so sensitive, the bands seemed always open. The transmitters and antennae were so efficient that to call a station was to receive a reply. The rarest DX was worked as easily as you would a local. In addition, "Jeeves" was ready at a moment's notice to brew a delicious pot of coffee and prepare some tasty snacks which Bill could enjoy between contacts. It was indeed the "ultimate" QTH.

Bill, however, found that he soon tired of the "dream" console. Nothing but nothing ever went wrong. It was almost too perfect. Once he suggested to "Jeeves" that perhaps he could overhaul a transmitter or receiver just to relieve the monotony. But "Jeeves" assured him: "Sir, nothing ever requires maintenance *here*." Another few months went by and Bill was beside himself with boredom. In desperation he accosted his host and said, "I know what a great honor it is to be sent here, but at times I almost wish I had been sent down below to the "other" place, it could hardly be any worse." "But Sir," "Jeeves" said, "Just where do you think you are? —*This* is Hell." ■



*Two Barnard Road, Armonk, N. Y.

A portion of the set-up at WA2WEB just prior to OSCAR's launch.

After OSCAR's launch, the equipment was spread out for operating convenience. Shown between orbits no. 6 and 7 are from left to right Mike, WA2ANY; Bill, WA2INB; Ray, K2AQG; Shelly, WN2OHH; Rene, WB2NCB; and Dave, K2LME.

"HI OSCAR, de WA2WEB..."

BY WILLIAM I. DUNKERLEY, JR.,* WA2INB

"HEY Bill, OSCAR is up!" came the excited voice of Dave Collins, K2LME over the telephone on the afternoon of March 9. Before the passing of many more minutes these words rang out from the telephone receivers of other members of the East Coast VHF Society as news of the launch of OSCAR III, the world's first amateur radio translator satellite began to fan out among members.

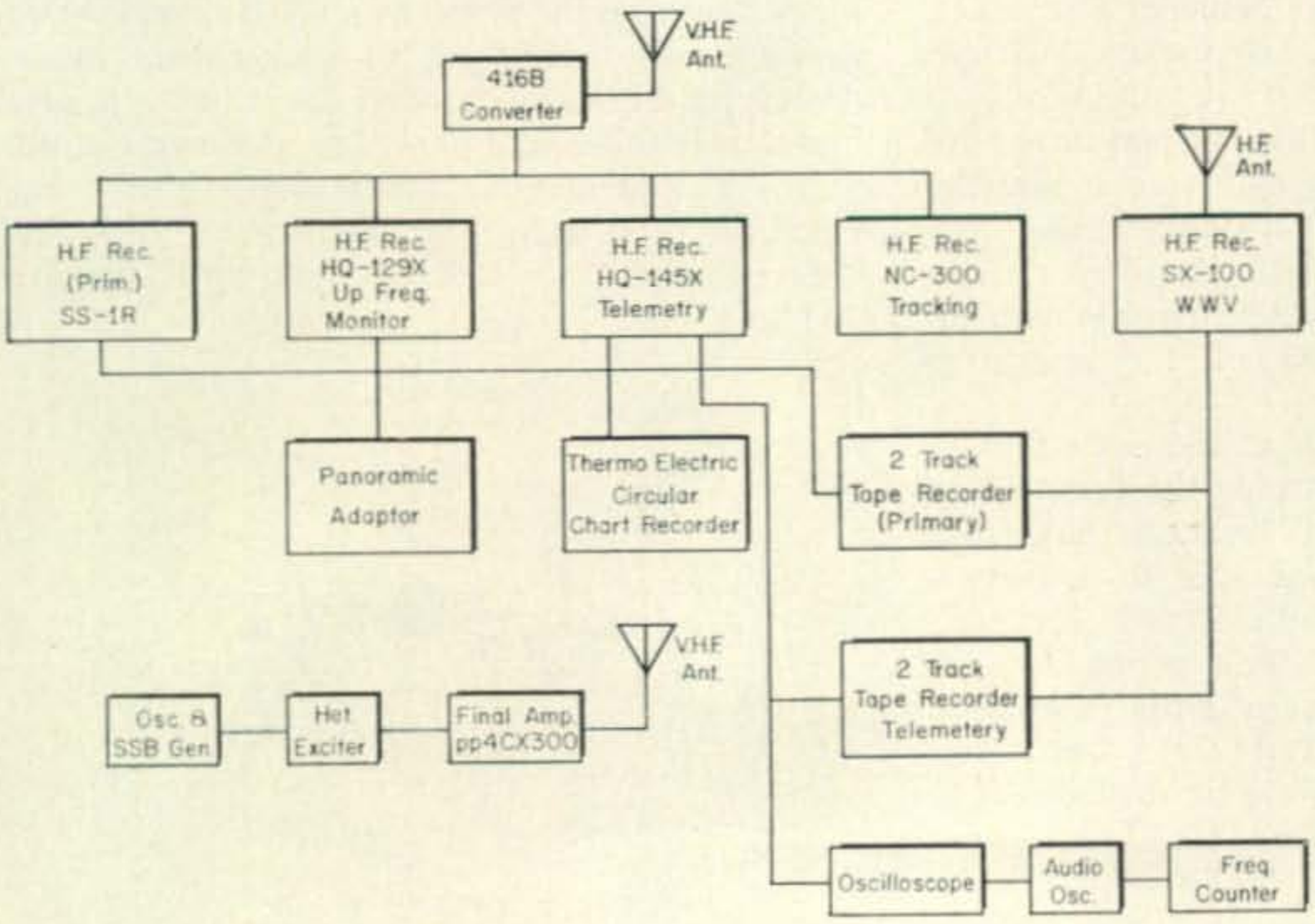
News of the launch was received with a great deal of enthusiasm, because for the past half-year the group had been hard at work readying a complete ground station to be used during the orbital flight of OSCAR III.

The Society's interest in working with OSCAR III began shortly after the International V.H.F. Convention sponsored by the Society as a part of the ARRL National Convention in New York during August, 1964. This Convention pointed out the importance of radio amateurs keeping abreast of the rapidly advancing field of space communications, and the Society felt that working with OSCAR III would be an excellent way of beginning to do such.

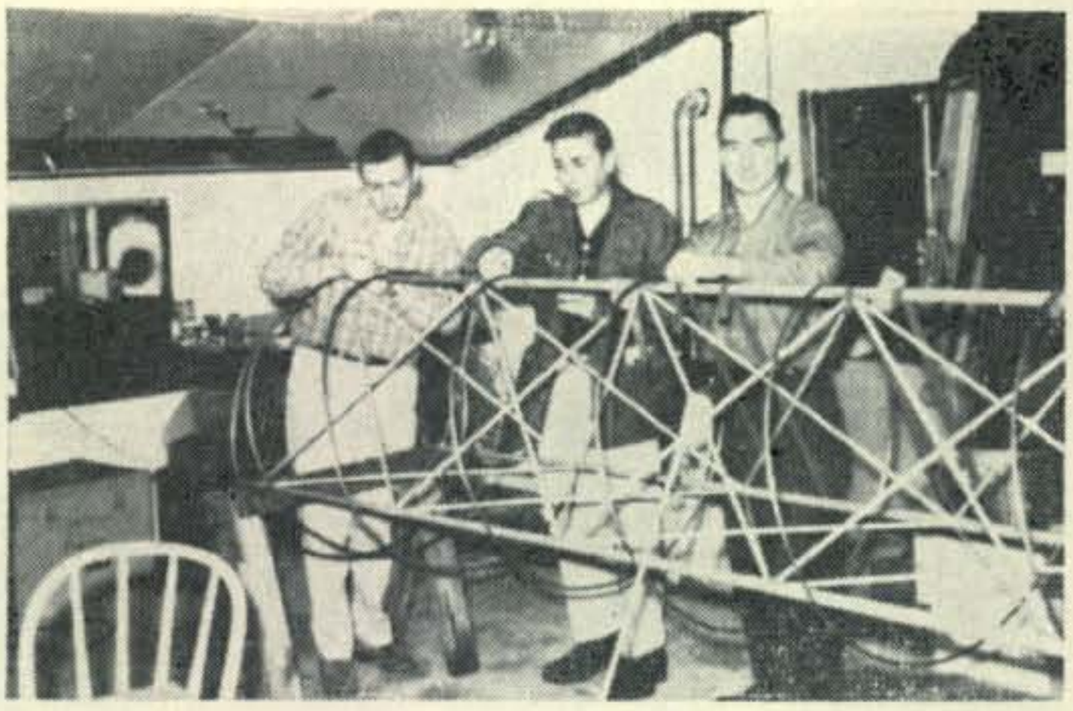
Meeting after work and on weekends, the group began to draw up plans for their satellite ground station. After several meetings went by, a list of "things we don't have" was compiled:

(1) about five h.f. receivers.
(2) at least one "precision" type receiver for primary communications.
(3) a kw transmitter.
(4) a low noise v.h.f. converter.
(5) some means to record signals, signal strength, and telemetry data.

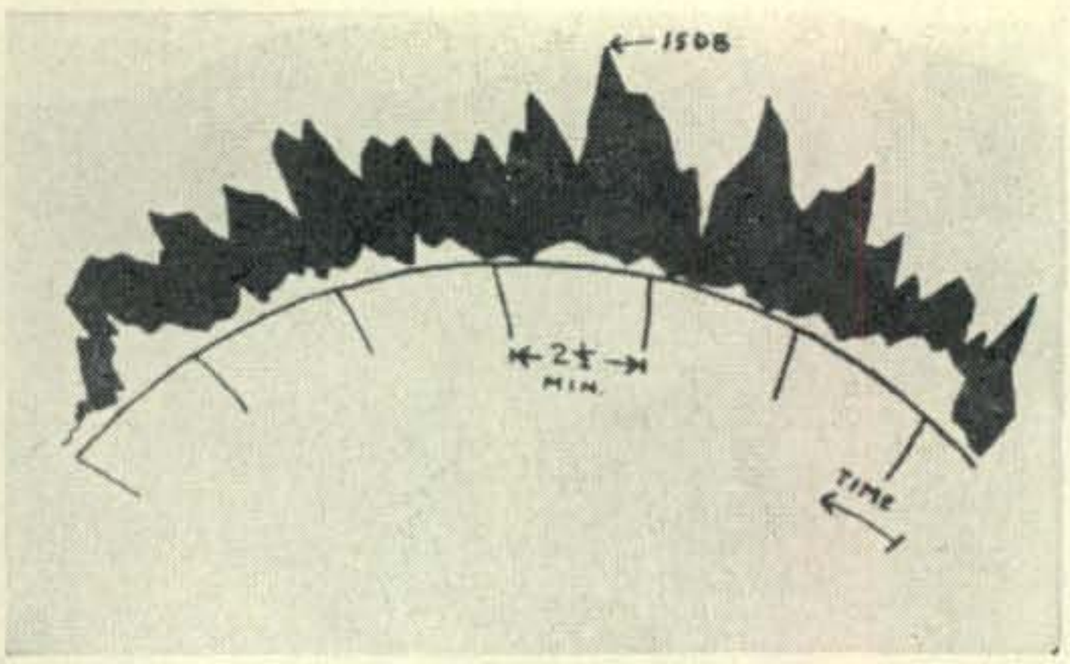
*2 Ray Street, East Paterson, New Jersey



A block diagram of the Society's OSCAR III ground station.



Construction is beginning on the helix antenna designed by K2AQG. From l. to r. are Shelly, WN2OHH, Ray, K2AQG, and Rene, WB2NCB.



A typical signal strength recording made at WA2WEB. The dark area is OSCAR's signal, and the light area below it is local noise. This recording was made on orbit number 366.

(6) a steerable, high gain antenna having circular polarization.
(7) miscellaneous ad infinitum.
(8) a place to put all of the above!

A two car garage in Saddle Brook, New Jersey which belongs to a member was found suitable as a location for the ground station. Pooling communications receivers from member's home stations met the requirement for five h.f. receivers, and a Squires Sanders SS-1R was obtained for use as the primary communications receiver.

Construction began on a KW power amplifier using a pair of Eimac 4CX300A's, and on a hetrodyne unit which would be used in conjunction with an available 14 mc s.s.b. and c.w. source. The machine shop facilities for working on the power amplifier were obtained from, of all places, an audio firm (Robert's Audio Engineering Co.). The low noise v.h.f. converter consisted of a surplus 416B pre-amplifier converted from 220 mc to 144 mc (having a noise figure of 1.8 db) fed into an amateur NUvistor type converter.

Tape recording of signals and telemetry data was accomplished by a two track tape transport for which a member constructed the necessary electronics, and a stereo recorder belonging to another member. Signal strength of OSCAR was recorded on a Thermo Electric circular chart recorder.

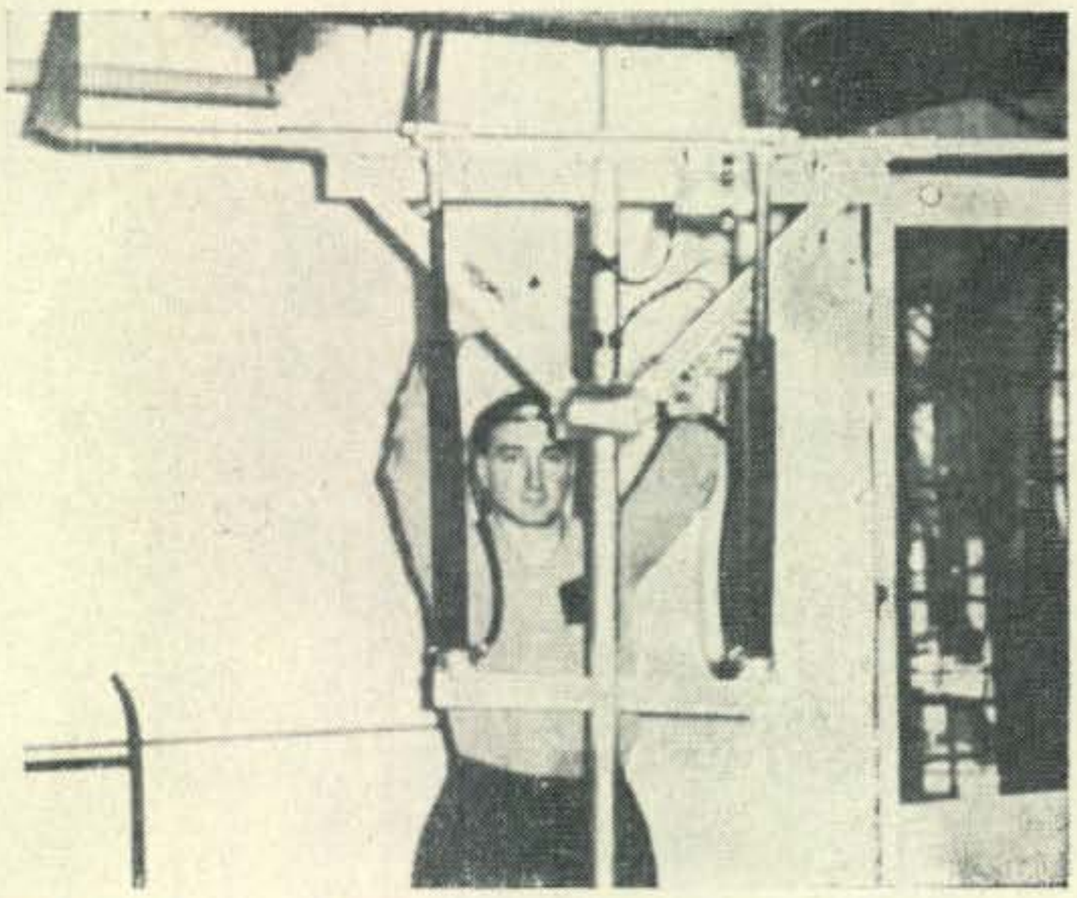
For the antenna requirement, a dual helix was constructed having a gain of 16 db and providing right-hand circular polarization. To make the antenna steerable, an azimuth-elevation mount was constructed. It uses a CDR Ham-M rotor for azimuth control and the actuators from a Ford retractable hard-top automobile (found in a local junk yard) for elevation control.

Throughout the construction phase of the Society's project, the exact date of OSCAR's launch was not known. The group, though, had set "sometime during March" as a completion time for their station.

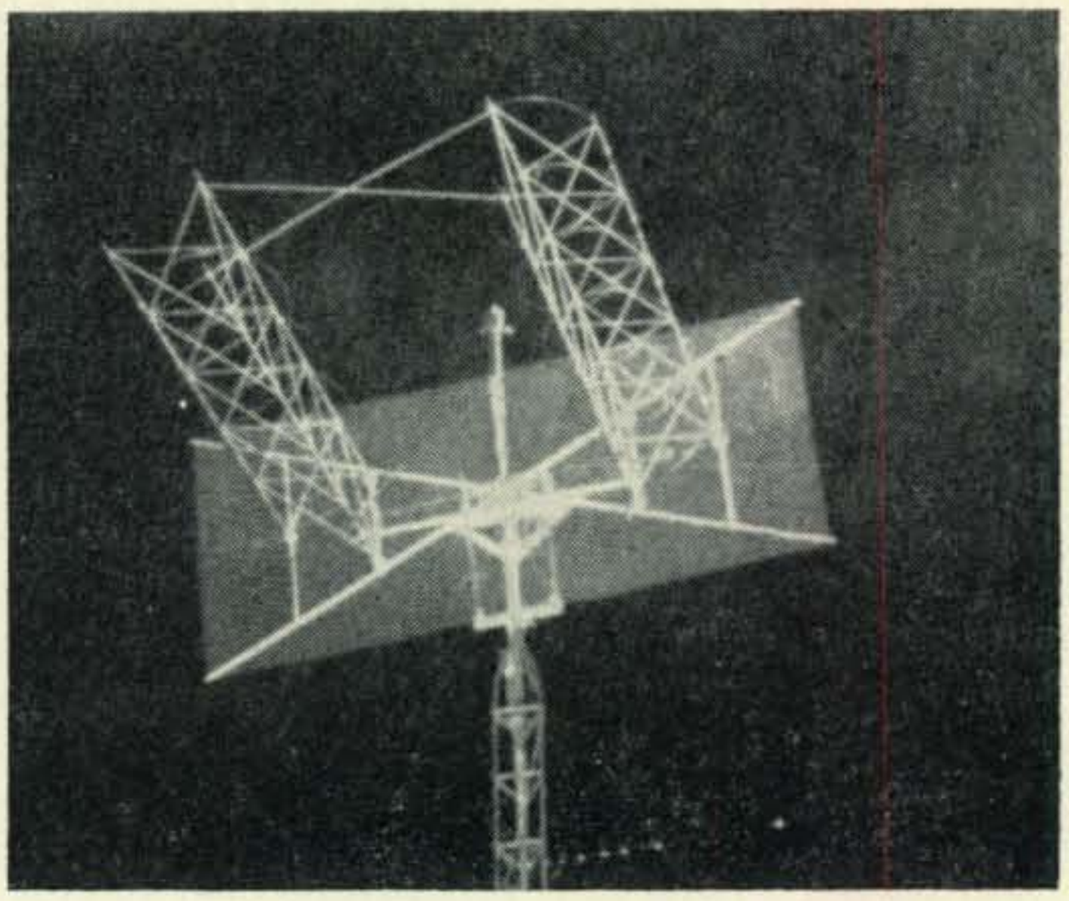
"I hear it ! ! !" shouted one fellow, shattering the impatient silence surrounding the group of amateurs assembled at Saddle Brook to hear the first pass of OSCAR III over the east coast of the United States. "Yes, its there, and its getting stronger!" And sure enough, the cheery "HI" of OSCAR filled the shack as broad smiles came across the faces of the participants. "This thing works!"

For the next 19 days while OSCAR's frequency translator continued to function, the East Coast VHF Society's ground station remained

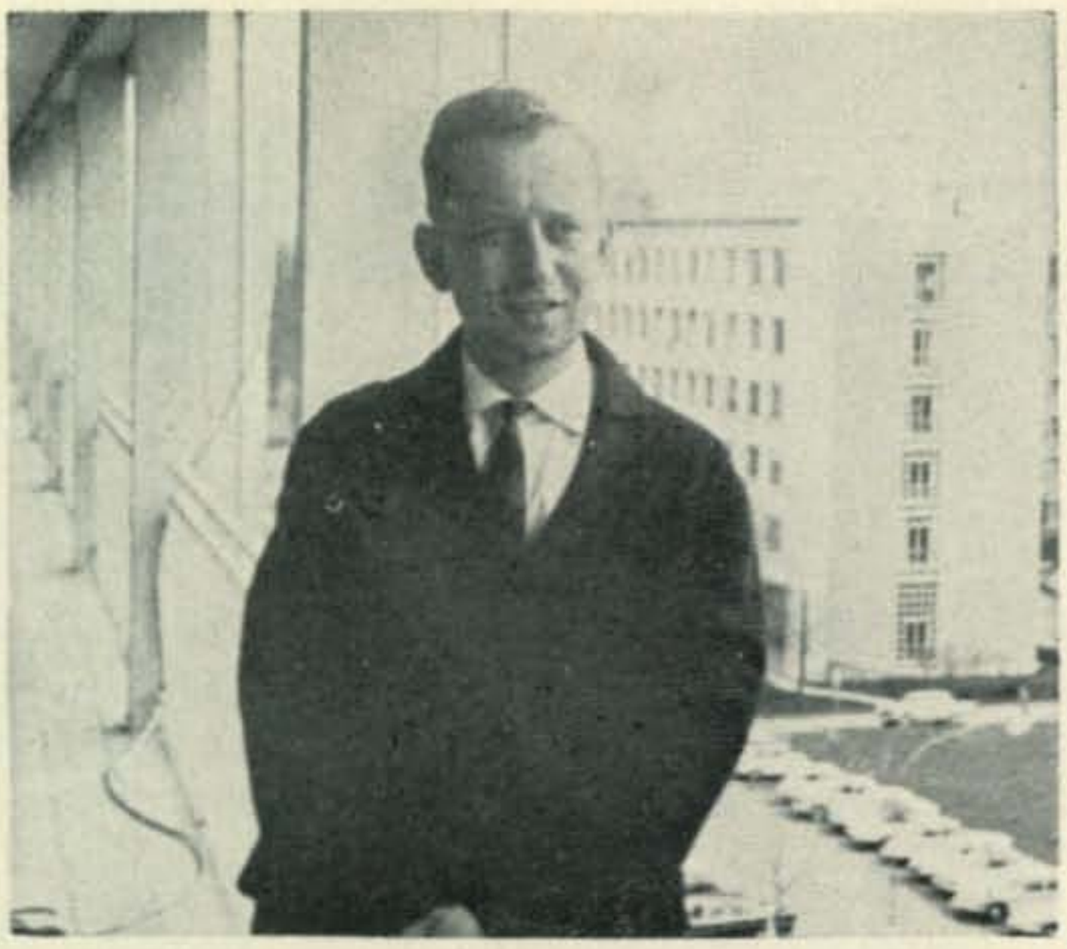
[*Continued on page 104*]



This is the azimuth-elevation mount that is used to steer the large helical antenna. The fellow who appears to be caught in the mechanism is Rene, WB2NCB.



Shown resting on its 50 foot perch is the helix antenna. The helicies are each ten feet in length, and the ground plane measures 6 ft. by 13 ft.



Ing. Igor Dolezel, OK1FY/HB9, shown at the ITU in Geneva, Switzerland where he is a staff Engineer. Igor is also a station engineer at 4U1ITU, and was responsible for making exceptionally accurate orbital predictions for the OSCAR III satellite.

Lyle Copmann, CP1DM, Press Attache of the American Embassy at La Paz, Bolivia, shown presenting a framed "First Day Cover" of the recentiy issued U.S. Amateur Radio stamp to the Bolivian Radio Club during a special meeting marking the club's 25th Anniversary. Pictured are (from left), CP1DM, CP1DR, CP1BE, CP1CT (President of the club), CP1CZ.

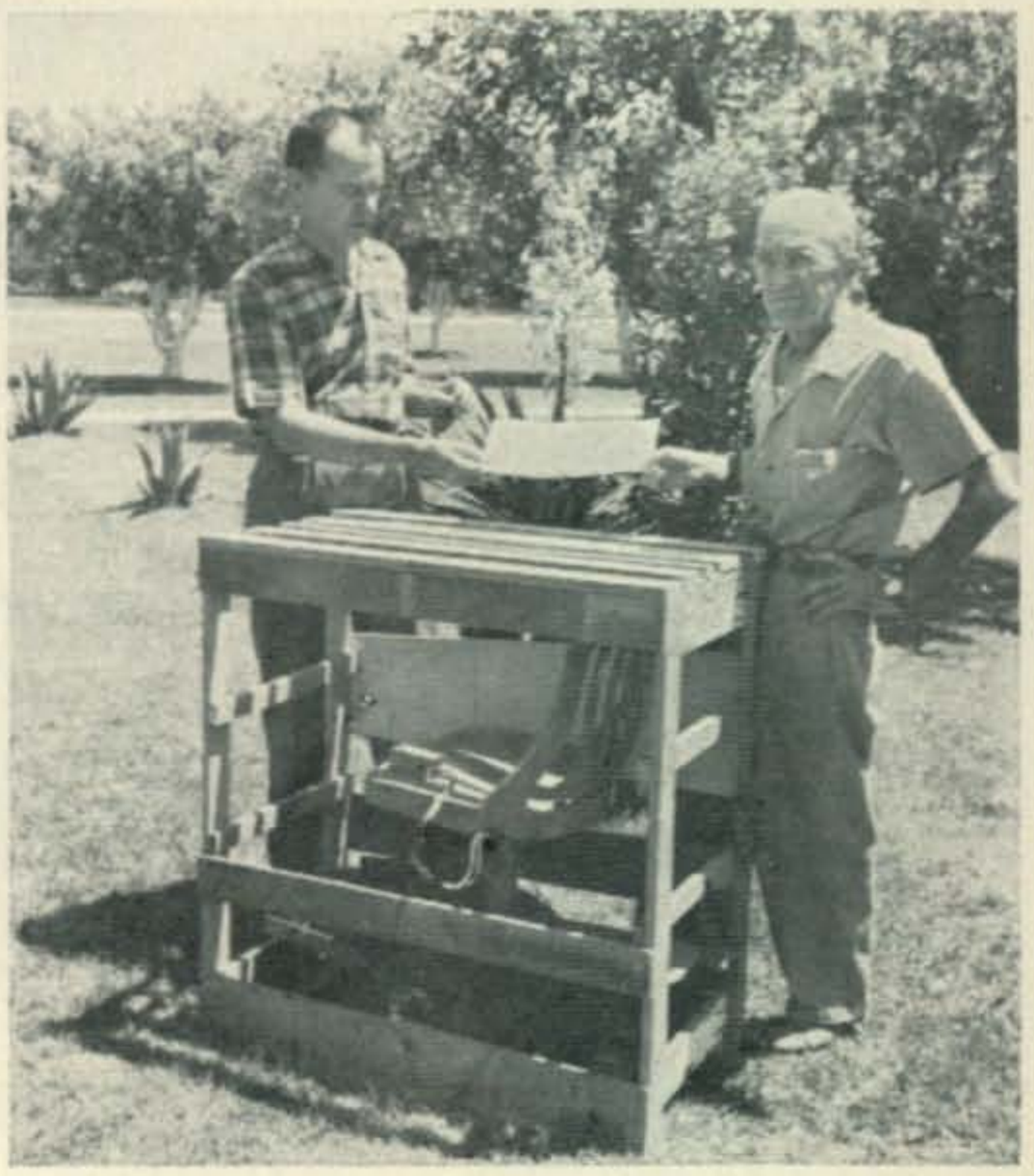
PEOPLE AND PLACES

On May 14th, a motorized wheelchair was shipped from Phoenix, Arizona to Saskatoon, Canada, as a gift to Leo Myers, VE5LM, a severely disabled amateur radio operator.

It started several weeks ago when Bill Rhodes, W7KLA, (left) 4421 North 13th Place, Phoenix, was listening on his short wave receiver. Leo in Saskatoon was describing his difficulties in moving around his ham shack in a wheel chair. Bill broke in and offered to donate a motorized wheel chair to Leo if a way could be found of shipping it to Canada. Also listening at the time was Ed Keaveney, K7LYD, (right) 6246 North 13th Place, who agreed to arrange for shipping.

Ed contacted the Phoenix VHF Radio Club and the Arizona Amateur Radio Club. Crating material and funds to cover transportation were donated by the clubs. Ed arranged customs clearance and trucking.

A rare photograph of a group of rather distinguished radio amateurs shown at a recent get-together at the shack of Bill Von Meister, K2ZRK/4, John Gayer, HB9AEQ (former President of the International Amateur Radio Club, Geneva, Switzerland), Larry DeMilner, W8NRB, (who recently returned from the Soviet Union where he operated /UA1, /UA3 and /UB5), Bill Orr, W6SAI, of Project OSCAR fame, Nick Lassiter, OH2XZ, *CQ*'s own George Jacobs, W3ASK, and Bob Fitz, W4RBZ. The group got together to hear Larry unfurl story after story about operating in the Soviet Union.



RTTY From A to Z

BY DURWARD J. TUCKER*, W5VU

Part XII

This installment gives a detailed treatment to some of the types of distortion touched upon earlier. There is bias distortion, end distortion, fortuitous distortion and characteristic distortion.

BIAS distortion was introduced in Part 10 along with a step by step procedure to minimize this in the polar relay. Part 11 covered mercury relays and solid state relays noting some of the advantages and disadvantages of both types.

Bias distortion does not originate only in polar relays. There are other sources of this type of distortion in the RTTY system. However, bias distortion from the polar relay is probably the easiest to track down and correct.

Nature Of Bias Distortion

The discussion of bias distortion, as covered sometime back, was centered around the polar relay. It was discussed there as a "byproduct" of a mechanical misalignment of the polar relay. It is considered that a review or discussion of the nature of bias distortion is in order since bias distortion is not restricted to just the polar relay. In fact, it is almost a constant and unwelcome companion of the RTTY'er. Maybe "adversary" would have been a better word to have used because bias distortion gives the RTTY'er unending harassment. Probably more experimenting, researching and circuit wizardry has been dreamed up to lick this one RTTY culprit than for any one thing.

Consider a simple square wave. If such a wave is passed through a half-wave rectifier then a wave form such as that shown in Fig. 75(a) is obtained. This is a pulsed wave with equal periods of signal and no signal. Consider the periods of signal as *mark* and the periods of no signal as *space*, with all periods, whether *mark* or *space*, being equal. This represents a signal with *no* bias distortion.

Figure 75 (b) is simply an expanded view of one cycle for better viewing clarity. Let us suppose that *mark* and *space* are no longer equal as in (b) but 25% *marking bias* is present as illustrated in (c). In this case, *mark* is 25% longer and *space* is 25% shorter. This condition exists because the *space-to-mark* transition is 25% *early*. Let us suppose that 25% *spacing bias* is present as illustrated in (d). In this case, *space* is 25% longer and *mark* is 25% shorter. This condition exists because the *space-to-mark transition* is 25% *late*.

A simple on-off or reversal type of signal was used in the examples of fig. 75 in order to keep things simple and as uninvolved as possible. The important thing here was to show the reader that the fundamental mechanics of bias distortion are actually pretty simple. Before we leave the subject of the nature of bias distortion it might be well for us to go through the whole process covered in fig. 75 with an actual teletype code character. The character "R" was selected since it has already been under discussion in

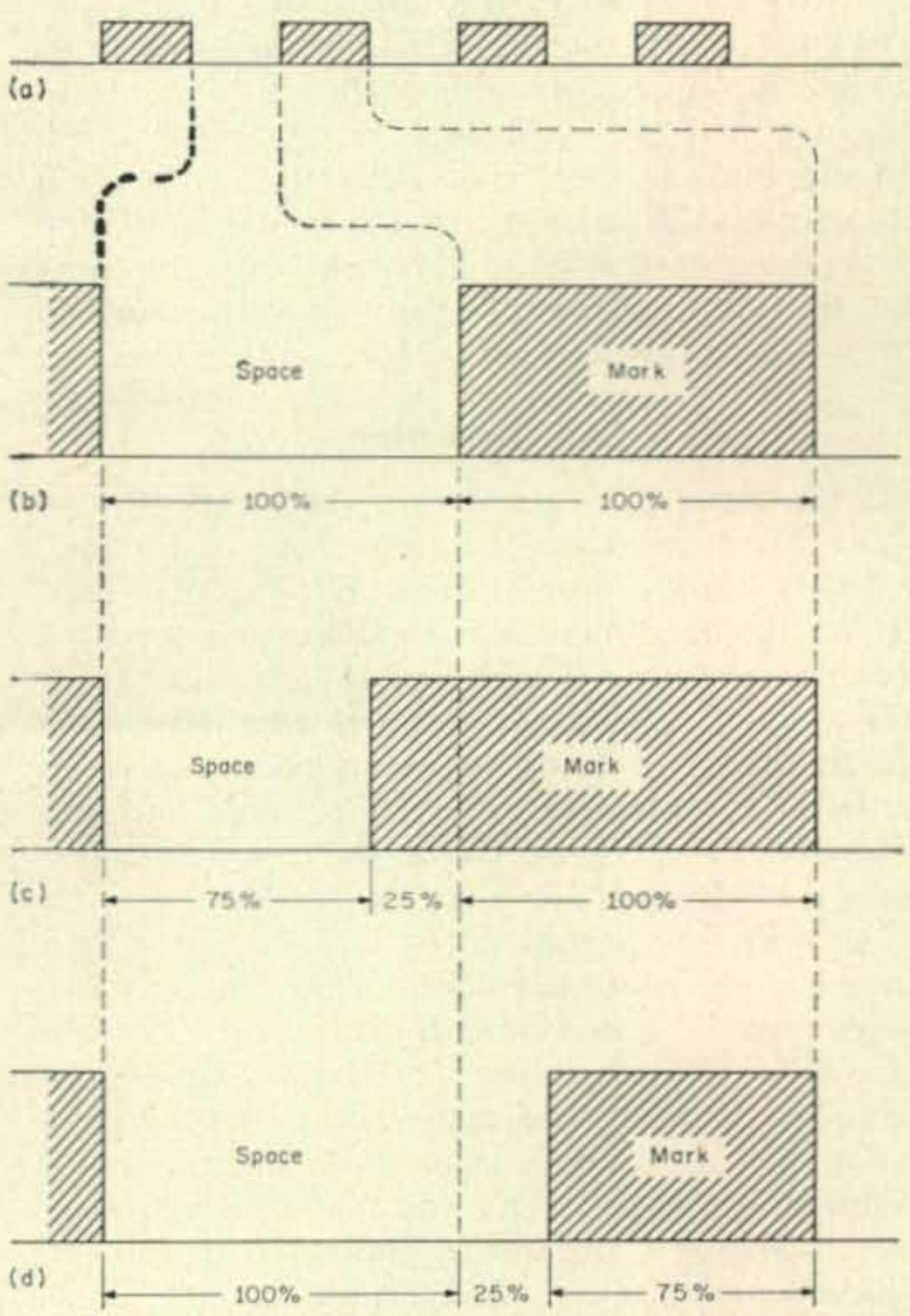


Fig. 75—(A) The periods of signal and no signal (*mark* and *space*) are all equal. (B) shows one cycle expanded for clarity. (C) shows the actual configuration if 25% marking bias is present and (D) if 25% spacing bias is present.

*6906 Kingsbury Drive, Dallas 31, Texas.

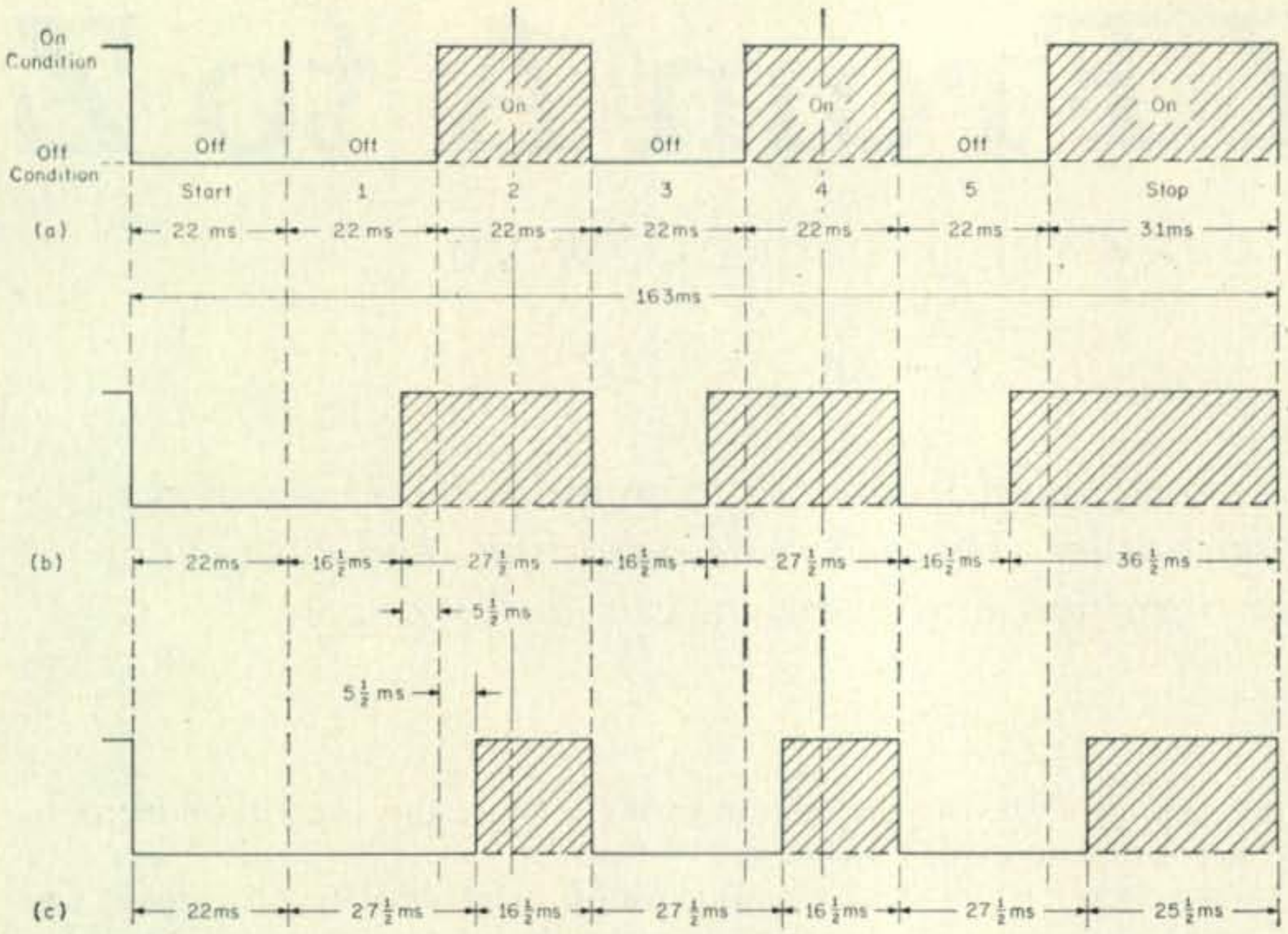


Fig. 76 — (A) is the Teletype code for the character *R* with no bias distortion present. (B) indicates the presence of 25% marking bias distortion and (C) indicates presence of 25% spacing bias distortion.

this series. This is shown in fig. 76. If there is any difficulty understanding fig. 76, refer back to fig. 75 again. Do not go on to *end distortion* which is covered next if you are still having difficulty with bias distortion. There is a similarity between the two that gives the uninitiated a bit of difficulty in distinguishing one from the other and remembering which is which.

Let us go back for another look at the teletype code character "R" which is reproduced as (a) of fig. 76. Figure 76(b) shows 25% marking bias for "R" and fig. 76(c) shows 25% spacing bias. It will be noticed that with 25% marking bias distortion that the signal transition from *space*-to-*mark* is 5½ milliseconds *early* and that the transition from *space*-to-*mark* is 5½ milliseconds *late* with 25% spacing bias.

End Distortion

If the term *"bias distortion"* sounded strange to the beginner, then the term *"end distortion"* probably sounds more strange. The beginner usually has some difficulty with these two types of teletype distortion because of their similarity. It may appear at first that they are essentially one and the same. Bias distortion is encountered in the *space*-to-*mark* transition of a signal and *end distortion* is encountered in the *mark*-to-*space* transition of a signal.

Consider the signal of fig. 77 (a) in which the *mark* and *space* segments of the square wave pulses are of equal length as in fig. 75 (a). Figure 77 (b), as in fig. 75 (b), is simply an expanded view of one cycle for better viewing clarity. Let us suppose that *mark* and *space* are no longer equal as in (b) and that 25% *marking end distortion* is present as indicated in (c). In this case, *mark* is 25% longer and *space* is 25% shorter. This condition exists because the *mark*-to-*space* transition is 25% *late*. Let us suppose that 25% *spacing end distortion* is present as illustrated in (d). In this case, *mark* is 25% shorter and *space* is 25% longer. This condition exists because the *mark*-to-*space* transition is 25% early.

A simple on-off type of signal was used in fig. 77 to explain end distortion as was used in fig. 75 to explain bias distortion. Figures 75 and 77 should be thoroughly compared to see the difference between these two types of distortion. Figure 78, using the teletype code character "R", is used to further explain end distortion. The teletype code character "R" with no end distortion (or any other distortion) is shown in (a). Figure 78 (b) shows the character "R" with 25% marking end distortion and fig. 78 (c)

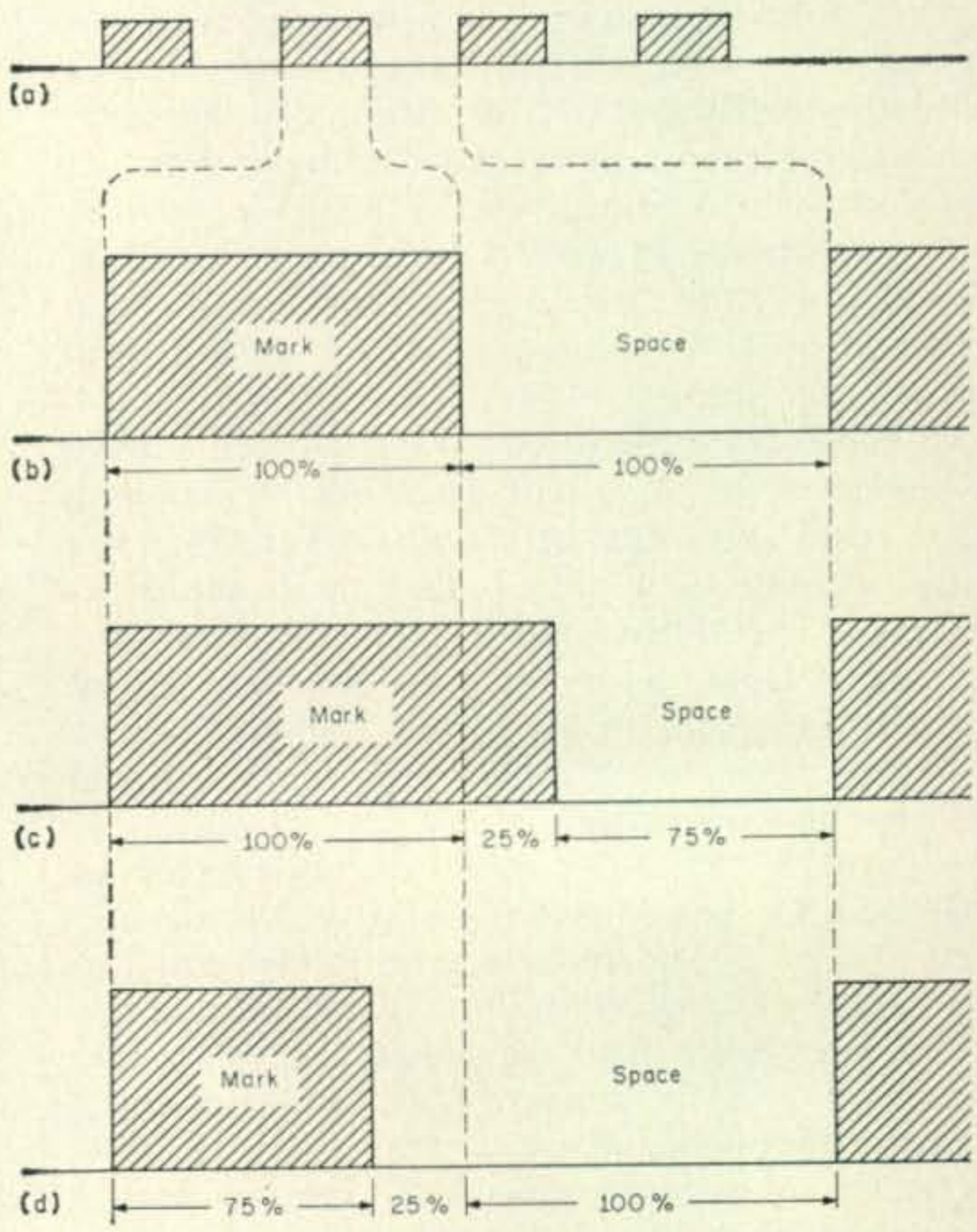


Fig. 77—(A) and (B) indicate signal and no signal (*mark* and *space*) all equal. (C) represents 25% marking end distortion and (D) 25% spacing end distortion.

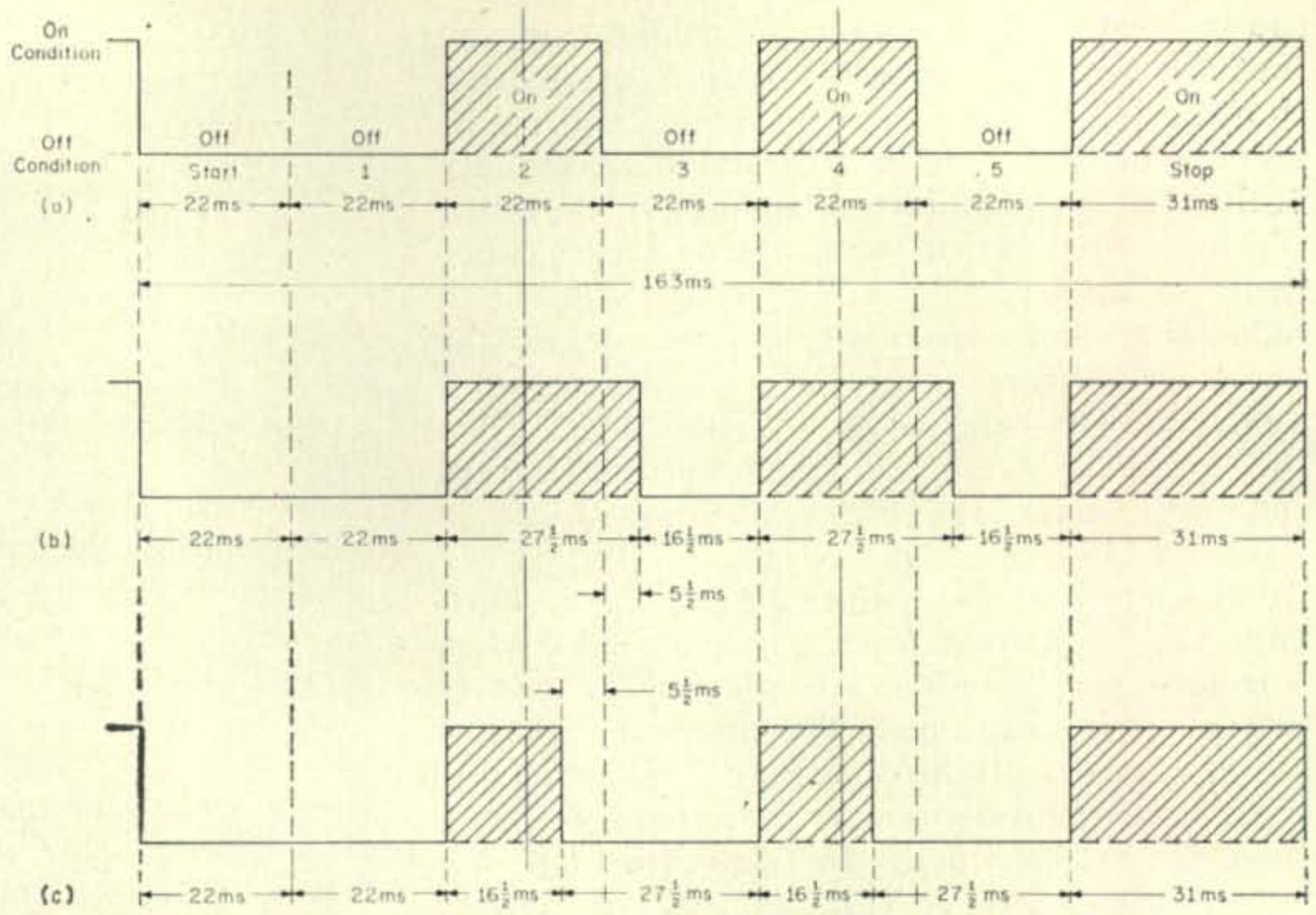


Fig. 78 — (A) is the Teletype code for the letter *R* with no distortion present. (B) shows the introduction of 25% marking end distortion and (C) shows 25% spacing end distortion.

shows 25% spacing end distortion for the letter "R". It will be noticed that with 25% marking end distortion the signal transition from *mark*-to-*space* is 5½ milliseconds *late* and that the signal from *mark*-to-*space* is 5½ milliseconds *early* with 25% spacing end distortion.

One may be prone to question any real difference between bias distortion and end distortion, since one occurs on the front end of the *mark* pulse while the other occurs at the other end of the *mark* pulse. Perhaps the simplest answer is that early experiments seemed to think that there was a difference between the two and accordingly differentiated between them. One is just about as troublesome as the other since they both affect the *mark* pulse which reminds one that the selector magnet operates, or actually moves on the presence of a pulse (mark) and not on the absence of a pulse (space).

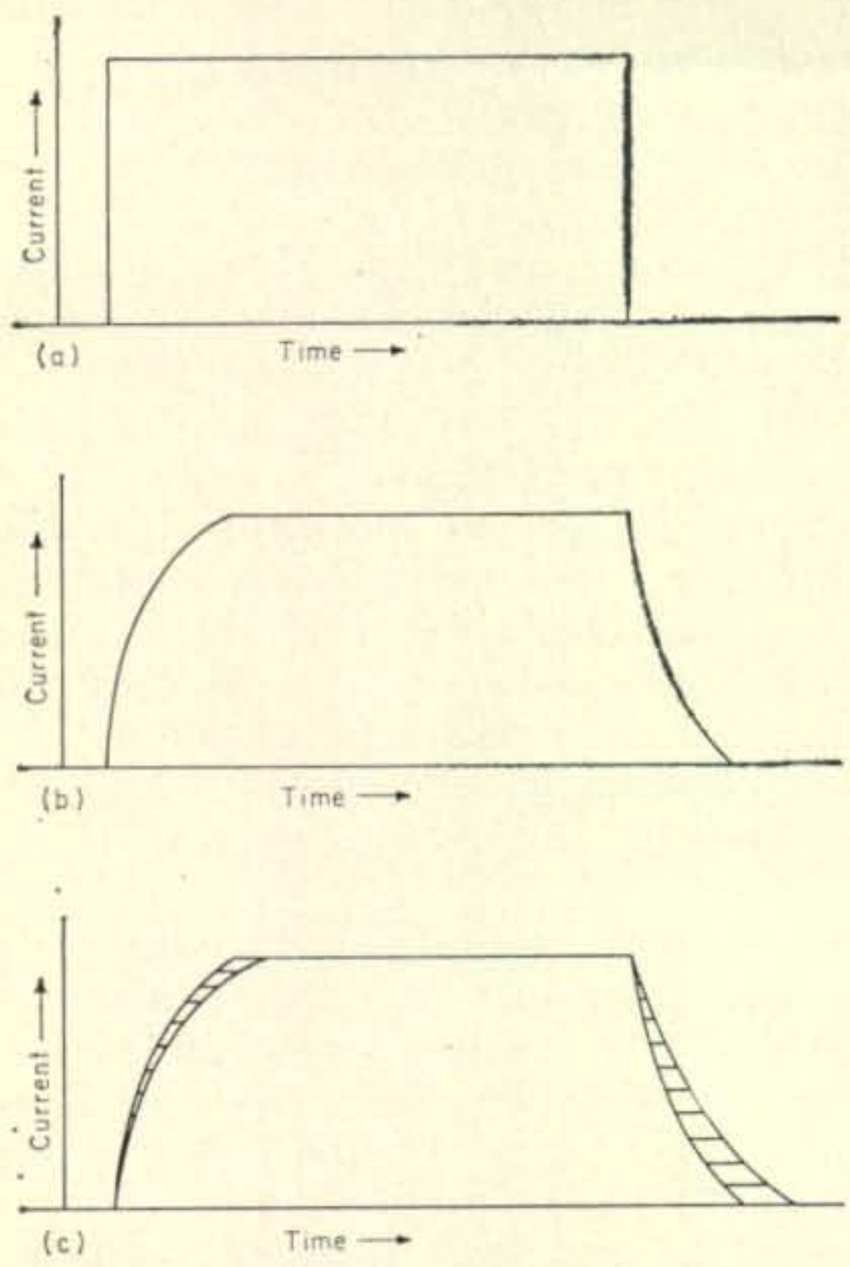


Fig. 79—(A) This perfect square wave is developed by opening and closing an energized circuit that contains only resistance. (B) is the resulting waveshape if the circuit also contains inductance. The effect of the addition of capacitance in the circuit is shown in (C).

Fortuitous Distortion

The *space*-to-*mark* and *mark*-to-*space* transitions are displaced by fortuitous distortion in a random fashion, shortening both the *mark* and *space* pulses. One source or cause of fortuitous distortion is the teletypewriter keyboard. Its cause and correction will be covered later on in this text.

There are other sources of fortuitous distortion such as sudden fluctuations of the local loop voltage. The use of regulated power supplies is very helpful. There are still other sources of fortuitous distortion. One of the worst, besides the keyboard transmitter contacts, is caused by multipath travel of a radio signal from the transmitting station to the receiving station.

Characteristic Distortion

One knows that where there is only resistance in a circut a waveshape is principally attenuated but not altered. When capitance or inductance enter into a circuit the wave may be altered—enter characteristic distortion. This type of distortion was briefly mentioned in connection with the Trepac semi-solid state 538-A polar relay sometime back.

The very nature of a teletype code depends upon the closing and opening of circuits in transmitting the "intelligence" to a teletype machine. The closing and opening of an energized circuit containing resistance only can result in a square current wave such as shown in fig. 79 (a). Consider the case of closing an energized circuit where inductance is present. This causes the current to build up from zero to its maximum value with a slight delay as graphically shown by the sloping part of the curve on the front side of the signal of fig. 79 (b). The

presence of the inductance in the circuit keeps the current from dropping to zero the instant that the circuit is opened. This is graphically shown in the "trailing" effect on the end of the pulse of fig. 79 (b). The presence of capacitance in the circuit causes further shaping of the rising (front) slope and of the decaying (rear) slope of the wave as shown in fig. 79 (c). Additional inductance and capacitance further shapes the wave as indicated in fig. 73. One can begin to appreciate the value of the "trigger control" on the Trepac 538-A relay just covered, and its function which was graphically illustrated in fig. 73.

Characteristic distortion can cause the shortening or lengthening of a single *mark* pulse when it follows two or more *space* pulses. The reverse is true for a *space* pulse. The amateur RTTY'er is not concerned with long lines and inevitable characteristic distortion but he is concerned with such devices as filters. In fact, filters are the "life blood" of one's Terminal Unit. Everyone knows that a filter is made up of inductances and capacitors. In fact, a good sharp filter is loaded with both and it certainly is no surprise that characteristic distortion appears when we get to filters. With polar relays it was bias distortion to combat. Now we find that with filters that it's characteristic distortion that we come to grips with.

The practical effect of characteristic distortion in filters is that the *mark* pulse, for instance, that is expected at a filter output, is dependent upon the pulses that preceded it as well as their polarity (*mark* or *space*).

40% Margin Of Distortion

It was stated earlier that a teletype machine selector magnet functions during 4.4 ms of the 22 ms allocated for each element of the five level code. It was further stated that it was desirable that the 4.4 ms period be located in the center of the 22 ms segment. This was graphically illustrated for the teletype character "Y" in fig. 26, and also indicated in fig. 80. It will be noted that 4.4 ms is 20% of 22 ms. If this 20% segment of time is located in the center of the 22 ms segment, it leaves a 40% time segment or 8.8 ms on either side as shown. This means that the selector magnet of a teletypewriter machine can not theoretically accept more than 40% bias or end distortion without making errors in copy. This assumes, of course, that the range finder of the teletype machine is properly adjusted so that the 4.4 ms time segment during which the selector magnet functions is centered in the 22 ms time allocated for the associated signal pulse. It might appear, to the uninitiated, that a 40% margin of distortion is so great that one does not need to be unduly concerned with distortion. This comfortable margin in allowable distortion, before errors of copy begin to appear, can in actual practice disappear all too soon.

In the first place, the receiving teletype machine may start making errors at a figure lower

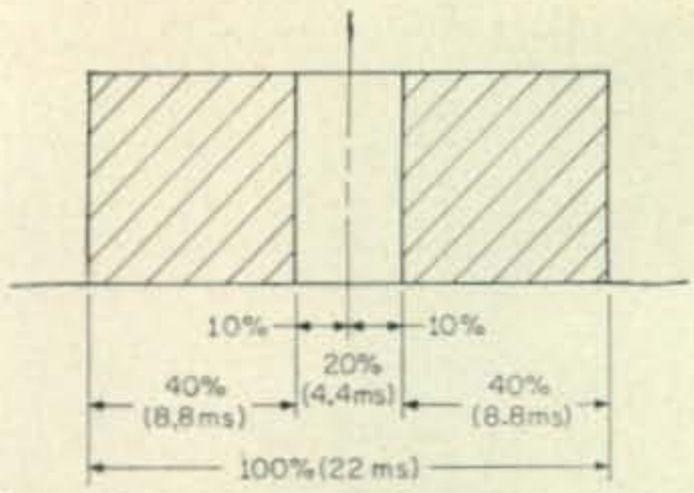


Fig. 80—The selector magnet functions during the 4.4. ms time segment in the center of the 22 ms signal pulse.

than 40%. This can be due to lack of proper adjustment of the machine or because the operating parts can not function properly due to an accumulation of a gummy substance composed of dirt, tar, grease, *etc.* that tends to restrict their operation. One of these is usually the case. Of course, it can be due to other things such as worn, bent or mutilated parts, springs too tight or too loose, *etc.* There is always the possibility that a particular teletype machine is so thoroughly worn that no amount of adjusting or cleaning will coax it to pass the 40% copy test. There is the possibility of distortion in both the sending and receiving process. The margin of maximum distortion can be due to the actual teletype machines themselves, as has been pointed out, to polar relays (also covered), to the Terminal Unit, or to a degradation of the signal in transit from transmitter to receiver. Whatever the cause, the cumulative effect of RTTY distortion can reach the copy error point more easily than one might think.

Distortion Conclusions

With all of the discussions of distortion in this text, one may get the idea that the RTTY'er is literally adrift in a sea of distortion without any recourse. The fear or apprehension of the unknown is usually worse than the real thing, so just knowing the exact status of a situation brings some satisfaction.

The techniques and types of equipment used to track down and measure these various types of RTTY distortion depend upon the type you are pursuing and whether or not one or more of the other types is present. Some devices either indicate or measure the *total distortion present*. For this reason, one needs to know the types of distortion present when using a device that measures total distortion. For instance, if one is trying to determine the exact amount of bias distortion present it is important to know if the figure obtained really is bias distortion or some other type.

One's thoughts naturally turn to the possibility of distortion measurements and ways and means of making such measurements. The availability of instruments to measure distortion such as encountered in amateur RTTY work is practically nil so far as the amateur is concerned. Naturally, the Bell System companies have such instruments but not in great quantities as each instrument serves quite an area or "goes a long way". This means that this source is nil. A few

[*Continued on page 94*]

Calling All RTTYers

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- Will mount in standard 19 inch rack panel, if desired.
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- Cost government over $250.00.

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For further information, check number 37, on page 110

The Waters Codax. The protruding assembly at the center foreground has the dot paddle on its left side, the dash paddle on the right. Edgewise-mounted knurled discs control the tone-monitor level (at the left) and the keyer speed (at the right). The monitor phone jack and the cables for the transmitter and receiver connections are at the rear.

CQ Reviews:

The Waters Codax Automatic Keyer

BY WILFRED M. SCHERER,* W2AEF

WHEN you've been used to a certain type of operation or equipment for many years, you sometimes resist "newfangled" ideas. This has been the tendency of this operator who has been accustomed to using a good ole fashioned bug over the past forty years, but finding it necessary to evaluate the Waters Codax, we were left no choice but to try it out and step in line with progress. Happily, it turned out to be a fortunate situation, since we took to this keyer like a duck takes to water.

The automatic keyer is an electronic device for producing trains of dots and dashes at a uniform speed, length and spacing. A double paddle is used which when pressed from one side produces a sequence of dots, pressed from the other side it makes a train of dashes. By proper manipulation of the paddles the correct number and order of dots and dashes may be transmitted to form code characters. Compared to the use of a straight or other mechanically operated keys, more uniform sending can be attained, and at faster speeds. Operation is less tiresome too.

The Codax

The Waters Model 361 Codax Automatic Keyer is a solid-state device utilizing 10 transistors and 14 diodes. Power is obtained from self-contained batteries. A double-paddle key is an integral part of the unit and it requires only slight pressure for operation, which together with the weight of the unit, keeps the Codax from "walking" over the table. Sending speeds of 5 to 50 words-per-minute may be selected with a speed control. The dots and dashes are simultaneosly controlled by this adjustment, so the correct spacing and dot-dash ratios are always maintained. Diddling with other controls is not needed for obtaining the proper ratios.

The Codax has a tone oscillator (frequency of approximately 1500 c.p.s.) that may be used to monitor the keying through headphones in connection with which there is an a.f. output-level control. An internal reed relay is used for directly keying the transmitter (blocked-grid keying). A "keyed a.f. output" connection makes it possible to key an s.s.b. transmitter through the microphone input with tone in the event direct rf. keying is not available, or in the case of an a.m. transmitter operating above 50 mc, m.c.w. may be had in a similar manner.

Another feature of the Codax is that you can route the receiver af. output through the Codax to mix the receiver output with the tone monitor, so the headphones may be used for signal reception along with monitoring of your own keying, without necessitating additional switching arrangements. Alternate connections may be made for loudspeaker listening and monitoring.

Circuitry

A block diagram of the Codax is shown at fig. 1. When *either* the dot or dash paddle is operated, it starts the blocking oscillator to run at a frequency determined by the setting of the SPEED potentiometer. The output of the block-

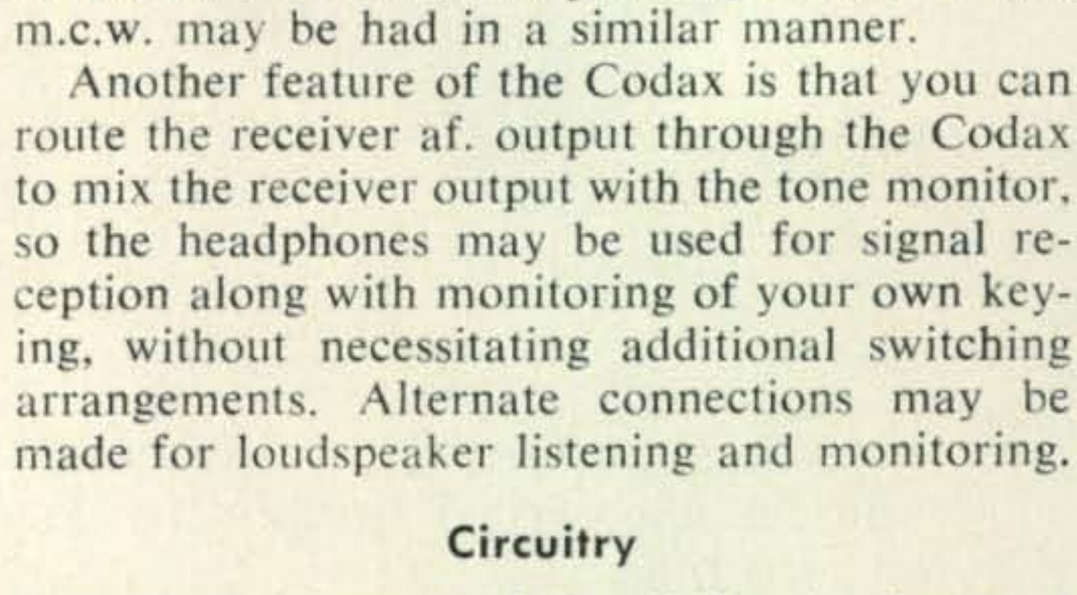


Fig. 1—Block diagram of the keyer.

*Technical Director, *CQ*.

ing oscillator is a series of pulses as shown at fig. 2A. These pulses feed flip-flop #1 which generates a dot and a space (fig. 2B) that goes into a summing circuit and then on to the reed-relay driver that operates the relay at the keying rate (fig. 2E). When just the dash paddle is operated, the dot pulses are shaped and inserted into a second flip-flop which operates at half the frequency of the dot pulses (fig. 2D). Its output, which is a pulse twice the length of the dot pulse, is passed through the gate which is opened by the dash paddle and is added to the dot output in the summing circuit as shown at fig. 2E.

The relay driver, in addition to operating the reed relay, also operates an a.f. oscillator from its collector to provide keyed audio output for monitoring in the mixer, and for insertion into the normal microphone input circuit of an a.m. or s.s.b. transmitter. Both spacing and dot-to-dash ratios are fixed (at 3 to 1) for all speeds of operation. There is no waiting to "catch" the oscillator, since the oscillator is always off until either paddle is pressed. Both dots and dashes are self-completing and a dash may be inserted into a series of dots at any time by pressing the dash paddle. The speed-control knob is calibrated for approximate speeds for ready reference.

Operating power is obtained from six internally mounted pen-lite-size mercury batteries. Battery life is rated at 400 or more hours of operation. The a.f. level control has a power ON/OFF switch attached to it.

Installation

Keying an s.s.b. or a.m. transmitter with tone requires only that the "keyed a.f. output" from the Codax be connected to the mic input of the transmitter. The mic gain is then adjusted for the proper a.f. operating level. In the case of an s.s.b. rig, tone keying will actuate the v.o.x. circuits so that receiver muting may be had along with v.o.x.-type of break-in.

C.w. transmitters may be keyed directly from the reed relay by connecting the transmitter keying circuit to the "key term" cable on the Codax. The reed relay will handle a limited amount of power. The maximum allowable potential is 250 volts and the maximum current is 1000 ma; however, you cannot switch more than 15 watts (potential × current). In most cases this will limit direct keying to blocked-grid systems. Where higher-power keying circuits are involved, an external keying relay must be employed that in turn can be keyed from the Codax reed relay.

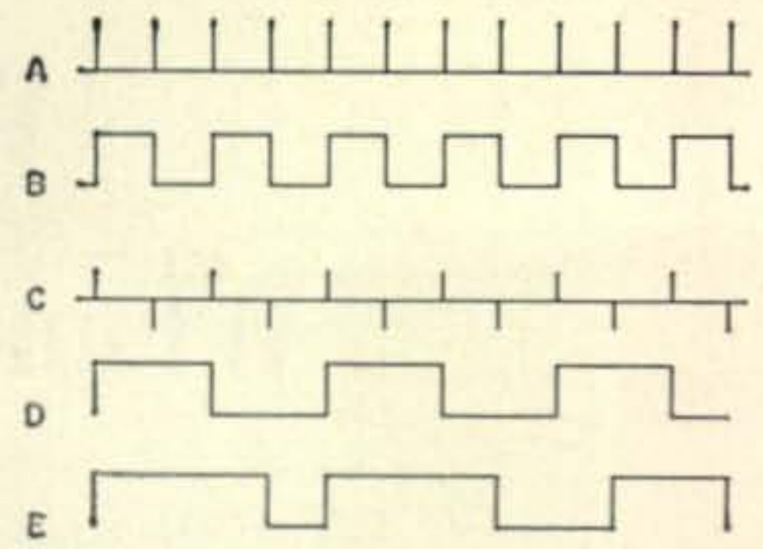


Fig. 2—Pulse sequence of the Codax Keyer. See text.

For receiver mixing with tone monitoring, a cable, supplied with a phone plug, is inserted into the receiver phone jack. With the headphones plugged into the Codax phone jack, you can then hear both the receiver output and the Codax keyed tone oscillator.

Operation

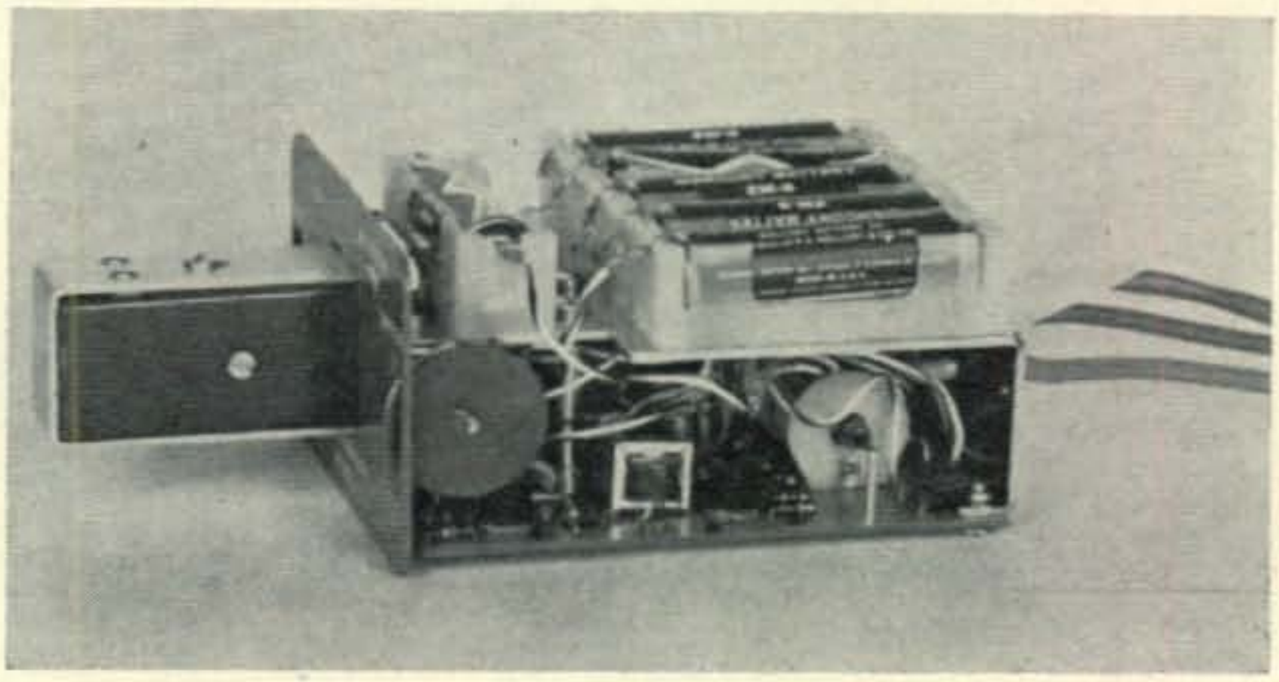
The factory adjustments of the paddles are for 20 grams pressure and a nominal gap of .001", but if this does not suit your taste, both the gap and tension for each paddle may be individually arranged by means of two adjusting screws available directly at each paddle. Also, if you are left-handed and wish to reverse the dot and dash paddles, you can do so by internally reversing the paddle connections. By the same token, you can connect up any other external type paddle or key in place of the Codax paddles.

Before attempting to use the Codax with a transmitter, the user should first practice with the Codax alone in conjunction with its tone monitor. Start at a relatively slow speed and learn the "feel" of the paddles and the timing required for sequences of a specific number of dots or dashes alone. Then try the various combinations of dots and dashes. An excellent procedure for practicing the formation of code characters and words will be found in a recent issue of *CQ*.[1]

As you catch on to sending words and sentences, you should acquire a definite rhythm

[*Continued on page 93*]

[1]Gleit, C. E. "Teaching Morse Code", *CQ*, March '65, p. 22.


Interior view of the Waters Codax. The self-contained batteries are neatly installed in special holders seen at the top. The electronic components are mounted on a printed-circuit board below. The round object seen at the lower right is the Reed relay.

Why Two When One Will Do?

BY ROBERT TELLEFSEN,* W7SMC/6

A simple means of reducing the number of control switches is explained below.

AFTER putting a Heathkit Monitorscope into service recently, I discovered that I was occasionally forgetting to turn it off with the rest of the station equipment. After searching for an easy way to accomplish this without rewiring the whole station, I thought of the cooling fan inside my HT-32.

The fan operates on 110 volts ac, is turned on by the transmitter power switch and has a separate outlet inside the HT-32 cabinet. It looked as though a cube tap plugged into the fan outlet would do the trick; that is, it did until I tried it. The space around the outlet was too small for the cube tap, and the fused plug of the Monitorscope would not fit through the openings at the rear of the HT-32 cabinet.

This latter problem could have been solved by removing the fused plug, passing the Monitorscope line cord through one of the rear cabinet openings, and reassembling the fused plug inside the cabinet. I decided against this because I wanted to be able to move the Monitorscope around and not have it tied to the HT-32.

The solution was to make an 8 inch extension cord, with a small plug on one end and a cube outlet on the other. Before the small plug was put on the cord, the cord was passed through the large cutout at the rear of the HT-32 cabinet and brought up between the cabinet and the rear apron of the chassis. This put the cube outlet in an easily accessible location outside the cabinet, but it left the fan plug still inside.

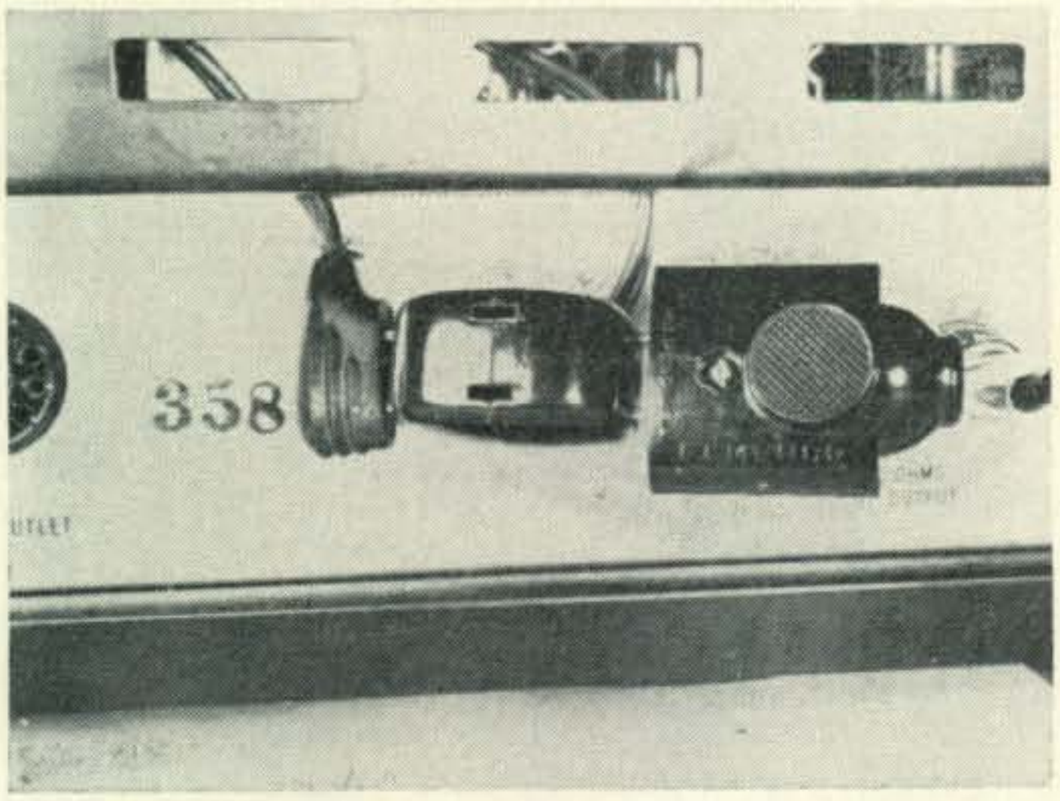
View of the extension cord plugged into ventilating fan outlet inside the HT-32 transmitter. The shield cage around the p a. has been removed for clarity.

The fan plug will not fit through the openings at the rear of the cabinet, so it is necessary to slide the transmitter out of the cabinet about an inch, and slip the fan plug through the gap between the rear apron of the chassis and the cabinet. Replace the transmitter in the cabinet and connect the fan plug and the Monitorscope plug to the cube outlet outside the cabinet.

With this arrangement, the Monitorscope can be removed at any time with little difficulty. Its power switch is left on all the time; the power is now turned on and off by the transmitter power switch. The transmitter fuse is not overloaded, since the Monitorscope only consumes 35 watts. This scheme will work with all models of the HT-32, as well as with the HT-37. It should also work with other transmitters having an internal 110 volt a.c. cooling fan.

If you have a use for a scheme such as this, give it a try. After all, why use two switches when one will do? ■

*277B Tyrella, Mountain View, California.



The ventilating fan plug and Monitorscope plug are shown connected to the cube tap outlet on the extension cord.

Late News About OSCAR III

OSCAR III Temporarily Silent

On May 26 Oscar III ceased to transmit telemetry signals on a regular basis. If our conclusions are correct, the situation is only a temporary one which should be alleviated by the time this issue reaches you.

Here at *CQ* we recorded the orbits that were within range on May 26, but following orbit 1087, Oscar went silent. Not having heard several of the morning orbits on the following day, the Project Oscar Association was alerted, and it was not until later in the day that Oscar was again heard during orbit 1099 both here and on the West Coast. We also heard orbit 1100, did not listen for 1101 and have been unable to hear signals on subsequent orbits.

Since Oscar III has been operating on Solar batteries, the first conjecture that comes to mind is that the satellite was passing through darkness during these silent orbits; however, a quick check correlating the orbital times with the orbital paths indicated this not to be the case.

Using a lamp bulb for the sun and a World Globe, the orbit track in relation to the sun was then traced from the time of launch until the present. When Oscar III was launched, the earth's position in its path around the sun and the position of the orbit around the earth were such that Oscar III travelled in darkness about 40% of the orbital time. Since the launch, the earth has moved around the sun by about 80° and during this time the apparent orbital shift has swung the track around so that Oscar now is travelling in sunlight most or all of the time.

The result is that the satellite does not pass through darkness for long enough periods for it to cool down, and its temperature has gone above 50° C. (112° F.), the limit for which a thermal switch in Oscar III is set to cut off the solar power to prevent overcharging and subsequent damage of the batteries which by now have run down (up to this time, observations of the telemetry bursts have indicated high temperatures near the limit point). Intermittent operation or complete silence may therefore be expected until the earth's position relative to the sun and the apparent orbital shift allow each orbit to pass through darkness long enough for sufficient cooling to cause the switch to recycle and allow the batteries to be recharged by the solar cells. If we've estimated correctly, this may take place in about three-weeks time from this writing (early June).

A reassuring note is that the built-in safety-measures apparently are functioning as they should, so let us hope that the diagnosis is correct and that Oscar III will soon be back in business with his cheery "hi's."

Things to Come . . . The Oscalator

The recent launching and success of Oscar III has indicated that space communications among radio amateurs is here! The old adage "you can't work 'em, unless you hear 'em" still holds true for the upcoming space age, only in this respect, "you can't hear 'em, unless you know where and when to find 'em".

With this in mind, next month we'll present the "Oscalator" that shows you an Oscar's track and where the satellite is positioned at any time. It will tell you when Oscar is due to enter your range or depart from it, from which you can figure the total expected in-range time. In addition, for future relaying—Oscars you'll be able to find out when the satellite will be in your range and that of another amateur station at the same time. From this you'll also be able to determine the possible times and duration for a QSO, the most desirable orbit and the equatorial-crossing longitude required for a useable orbit or for an overhead pass at your location. The direction in which your beam should be pointed for maximum effectiveness can also be determined. All this can be done in a matter of seconds for on-the-spot estimations or for long-range planning.

The Oscalator is simple to make. All that is required is paper and a compass. You don't need any globe, unwieldy wires, tables, charts, fancy mathematical calculations or even a map! All you have to know is the orbital time and the inclination of the satellite. Knowing these two parameters, you can then make the track for *any* other satellite such as a future Oscar.

In the event you don't have a hankering to make your own Oscalator, we are planning to have a limited quantity available with the Oscar III track (so you can practice using it until the next Oscar goes a-flying) with sufficient material for adding other satellite tracks. These will be supplied at a moderate fee out of which a donation will be made to the Project Oscar Association for the furtherance of future radio amateur communications satellites.

We're sorry that we could not tell you all about the Oscalator in this issue. Sufficient time simply was not available to properly prepare the material before our closing deadline, so we'll see you in the next issue.—*W2AEF*

Results of the 1964 CQ World Wide DX C.W. Contest

BY FRANK ANZALONE,* W1WY

OUR luck finally ran out on us, George Jacobs had predicted possible disturbed conditions over the c.w. week-end and that's just what we got. The lower bands, 80 and 40 were called fair by some and 20 as usual carried most of the load but it was a struggle. Compared to the past few years 15 was very poor and 10, forget it.

But then how does one explain W6AM's score on 7 mc, W4KFC's on 14 mc and W3GRF's third world high on all bands? Not to mention the K2GL total in the "multi-multi" division, the boys almost equaled their own record set some years ago during the lush years.

At W6AM it was Don Miller operating Don Wallace's rhombic farm, working the JAs by the hundreds and the UAØs and VKs by the scores. The long path to Europe produced the multiplier. Vic Clark took full advantage of the European openings on 14 mc, but the band was rather spotty at W4KFC, with weird long path openings to other areas. You don't explain a W3GRF score, I guess we just take it for granted that Lenny Chertok will be in the first section of the Top Ten every year. Thanks to the North Jersey DX Association, Lenny is finally being rewarded with a Trophy this year.

As for the other Trophies it's almost a duplication of the Phone Contest—a South American monopoly—although not dominated by the YV boys who seem to shun c.w. The all band winner is PY4OD, you might remember D'Angelo as the single band winner on 14 mc two years ago. UB5CI was close on his heels with an excellent multiplier but Vlad had too many 1-pointers.

Single band honors go to CX2CO on 14 mc, Ricardo duplicating his Phone victory and adds another Trophy to his bulging collection. However the most outstanding single band score was ZS6IW's on 21 mc, that's right, 21 mc. A few more multipliers and Michael would have pulled the biggest upset in the contest. Can't understand why more ZSs don't take advantage of the better conditions that evidently exist in that area.

The Israel Radio Club Trophy for the Top 40 meter score goes to Gene Walsh and his choice 5A1TW location. You will recall that Gene was a double winner on all bands last year. He has now moved to a new DL QTH so pickings will be a bit different. (I will forward the new address to the IRC just as soon as I have it.)

Another crew from the Radio Club Venezolano activated YV9AA on c.w. and duplicated their phone victory in the multi-operator, single transmitter division, so now the boys have two Trophies for their Club. The Junior/Senior team of Jeff and Tubby Vale again made an excellent score, this time using the call VK5ZP. They were last year's winners with the alternate call VK5NO.

So that left only one Trophy which was salvaged by the dogged efforts of the K2GL crew. The boys activated all bands around the clock and added another Trophy to Buzz Reeves' collection of wins in the "Big Gun" division, a

TROPHY WINNERS

Single Operator, All Band, USA
North Jersey DX Association Trophy
won by Leonard Chertok, W3GRF

Single Operator, Single Band (14 mc)
The K2HLB, Dr. Harold J. Megibow Trophy
won by Ricardo Sierra, Jr. CX2CO

Single Operator, All Band
The W9IOP, Larry Le Kashman Trophy
won by Talma D'Angelo Drummond, PY4OD

Single Operator, Highest Score on 7 mc
Israel Radio Club Trophy
won by Eugene Walsh, 5A1TW

Multi-Operator, Single Transmitter
The W3AOH, Tony Susen Trophy won by YV9AA (Ops. YV5AEC, 5AGD, 5ANT, 5BOA, 5BKA, 5GO)

Multi-Operator Multi-Transmitter
The W6AM, Don Wallace Trophy won by K2GL (Ops. K2GL, 2DGT, 2TXC, 2UYG, W1GYE, 2GLM, 2IWC, 6KFV, WB2MFX)

World High Club Score
CQ Club Plaque
won by the Potomac Valley Radio Club

9M4LP—Bob Snyder in far off Singapore, thousands of miles from populated DX areas. Still Bob was able to come up with a very respectable score on all bands, 10 thru 160, just missing the Top Ten.

K2GL on his way to copping the W6AM Trophy.

category dominated by the USA operators. (Unfortunately, W6VSS who would have placed third, is being disqualified pending FCC decision on a violation.)

This year the Deutsches DX Team graciously withdrew from competition although member stations entered for individual awards. This left the field wide open and an easy victory for the well organized Potomac Valley Radio Club. But the biggest and most pleasant surprise of the contest was the sudden appearance of the Frankford Radio Club. Without any fanfare the logs from the W/K3 area kept pouring in and the club credits going up. A couple of well organized "Big Gun" scores and they would have pulled a real upset. Nice going fellows, an excellent showing for your first crack at our World Wide DX Contest.

Once again 80 was mostly utilized by the all banders seeking additional multipliers, and by the Europeans. M1ZG, a DXpedition by DJ1ZG racked up the highest total of contacts but had to settle for second place on 3.5 behind 4X4DH for obvious reasons. Over here VE3AU made like a DX station working all those 2 pointers south of him and was high man in this hemisphere.

VE2UQ used the same technique on 160, although Gordy really stuck it out and worked the band clean Even W1BB found it rough getting across to the few Europeans that were above the noise level. It was good to hear contest activity on this forgotten band.

As for the other end of the DX spectrum, 28 mc, we have finally hit bottom, I hope. Except for a few weak watery signals in the north/south path, the band was absolutely dead.

Like all contest week-ends there are moments to remember and this one was no exception. A very happy one indeed for HI8WSR, Wilson got married on Saturday. The station was manned by W9SZR, although Al's time on the air was also limited by the nuptial ceremonies..

It was not a happy memory for YV1DP. While Greg was racking up the points his XYL, YV1GR had an accident while preparing lunch. Her face was burned so badly that she had to be rushed to the hospital. I am happy to report a complete healing with no scars.

Of course many were the reports of equipment failure. Here at W1WY I have also learned the meaning of true humility. I had made great plans for an all out effort on 21 mc only to have the power supply to the final blow up just as the band was opening up on Saturday morning. Rather than lose the opening to Europe I tried to go it "barefoot," a most frustrating experience. Gave 160 a try at night but band conditions were not for contest operating, so it's "wait until next year."

Did I say frustration? Put yourself in K3KMO's shoes. In last year's contest Al handed out 1085 contacts from San Marino, this year he couldn't buy one from M1ZG.

W4ZM had other kinds of trouble, it was a family get-together week-end, 7 of his own kids plus 9 grandchildren. It's a wonder he was able to get on the air at all. While at WA8EWT's George had to fight off two other members of the family who wanted in on the contest operating. Why not a multi-operator set-up?

The Rev. Paul Bittner had his usual Sunday problem, church duties of course. When he got back on the air after church the European opening had disappeared. He still came up top WØ on 14 mc. Wish we had more dedicated contest men in the 10th district.

JA1DUH had no particular problem, just low power, 30 watts. "QRP stations cannot win contest, but I have a bit of Olympic Spirit." Good for you, Hisataka.

DL7AA wants us to make it clear that IT1, UA9 and UAØ are separate multipliers. Right on the first one Rudi, IT1 is considered a multiplier in our contest because it appears in the WAE country list. However not so for the other two, it's a large country but still only counts as one country in the ARRL list. However because of its size we do award separate certificates.

Dom, IT1TAI has always been critical of our scoring system. A breakdown of his score on 7 mc with that of 5A1TW and 4X4FA, both on different continents, would indicate that he has a just gripe. However a change that would equalize the scoring in this area might work at a disadvantage in other parts of the world. He advocates a system in which QSO points value is determined by Zone/Country location, rather than continental. More study and research must be made before I can make any comments on the merits of this system. But can you imagine reeducating the thousands of contestants all over the world. Wow!

We still receive criticism regarding the change we made a couple of years ago, 2 points per QSO between North American stations, while other inter-continental contacts remained at 1 point. The hoped for increase in activity in the Caribbean and Central American areas never materialized. With only 12 entries from 8 countries in these areas it's very debatable that the W/K stations enjoyed any advantage. The Canadian participation has also remained very sparse in spite of the fact that we have been over generous in the distribution of certificates.

So forget the advantage, the Trophies are still going overseas.

W3AFM suggests that we encourage some real DX to participate in the contest, spice things up a bit. It's OK with us Paul, when some of you "hot shots" work the juicy ones why not do a little promotion work for us. But what's the matter with FB8WW, FB8XX, 5R8AM, FR7ZD, VP8HJ, AP5CP and AP5HQ, they can hardly be classed as run of the mill, and they were all in the contest.

ZL2AWJ had expected to be on from Chatham Island but the trip didn't come off, all his operating was from his home QTH. A few jumped the gun and took credit for a rare one.

There were also a couple of "Phonies" that had to be crossed off your logs. FP8CA created a pile-up on 20 but it was short lived. The real FP8CA/K2OJD happened to be monitoring the band from his home QTH. Rich quickly spread a warning and scuttled the pirate. A CEØAA also briefly showed up on 40 working the West Coast, but CE3AG, the licensee wasn't even on the air from his home QTH let alone from Easter Island, so scratch another one.

All the more active stations are plagued by fellows coming back for a second and more contacts. Hardi at DJ3JZ always rechecks his log before submitting it to us. He estimated his score would have been over 40,000 points higher without cancellation of the duplicates. As I have said many times before, it is the obligation of the contestant to check his log for duplicate contacts. Even tho you maintain a check list duplicate contacts will slip through, but these must be weeded out before you send in your log.

The Committee is considering imposing a penalty where duplicate contacts exceed a given percentage of your total contacts. And maybe even disqualification if the excess is too great.

A good percentage of the logs this year were "first timers," new comers to our contest, and understandably the scoring was not correct. If it looked high we knew that he had multiplied everything in sight, zones × countries × points. If low we generally found that the score on each band (the last column) had been added. All this made for more work, as if we didn't have enough.

Before we run out of space we want to welcome the YLs that bucked the competition on c.w. We are sure there were more but the following indicated the fact on their logs. WA1ANR, PY2SO, OH2YL, SP5YL, JA1YL and DJ9SB on the multi team at DLØMZ/LX. Sonia found it difficult to adjust herself back to normal life. During the contest the OM, PY2CQ took care of the children and pampered her with coffee and sandwiches. Wonder if there were any mother/daughter teams on the air? We had a couple father/son combos, W4HOS and W4FRO as well as the well known VK5NO and VK5ZP team.

[*Continued on page 98*]

United States Club Scores

Potomac Valley Radio Club	**6,366,671**
Frankford Radio Club	4,174,690
Southern California DX Club	2,371,241
North Jersey DX Association	1,169,755
Virginia Century Club	1,064,082
Ohio Valley Amateur Radio Ass'n	936,801
Northeastern DX Association	900,804
Florida DX Club	743,937
Royal Order of Boiled Owls (N.Y.)	628,635
Louisville Active Radio Operators (Ky)	436,007
Michigan State Univ. A.R.C.	343,130
Northern California DX Club	311,077
Long Island DX Association (N.Y.)	236,854
Orange County DXCC (Calif.)	214,473
Catalpa Amateur Radio Society (Mich.)	189,467
QCWA DX Club of New York	91,355
Central Michigan A.R.C.	55,528
Steel City A.R.C. (Penna.)	52,734
Maimisburg Wireless Ass'n (Ohio)	45,628
Willamette Valley DX Club (Ore.)	45,543
Key Klickers Klub (N.J.)	43,375
Joliet Amateur Radio Society (Ill.)	28,238
West High School A.R.A. (Ohio)	27,134
U.S. Naval Post Graduate School (Calif.)	20,400
N.W. St. Louis A.R.C. (Mo.)	18,900
Rochester DX Association (N.Y.)	10,047
San Diego DX Club (Calif.)	8,950
Richmond Radio Club (Calif.)	8,216

Foreign Club Scores

Radio Club Venezolano	3,951,443
Central Radio Club of Czechoslovakia	2,607,905
West Malaysians DXers	1,532,947
Uruguay DX Club	1,519,883
Swiss DX Club	1,303,419
Deutschen Demokratischen DX Radioklub	1,010,299
Radio Club de Costa Rica	1,003,701
Rumanian DX Club	878,310
Khazkov Radioclub (Ukraine)	848,944
Kakkosten-Kerho-Ry. (Finland)	838,023
Nykopingo Radio Amatorer (Sweden)	682,962
Locos del Aire (Ecuador)	524,208
Lvov DX Club (Ukraine)	523,839
Kagnew Station A.R.C. (Ethiopia)	464,175
Tutun-Radio Amatoorit-Ry. (Finland)	405,072
Chalmers Univ. of Tech. A.R.C. (Sweden)	346,086
OH–DX–Ring–Ry (Finland)	310,980
Far East DX-ploiters (Japan)	301,076
Akademisk Radioclub (Norway)	248,804
Cambrai Fritsch A.R.C. (Germany)	173,512
Hungarian Radioamateurs	145,838
Mihajlo Pupin Radio Club (Yugoslavia)	128,076
Kiel Canal Activity Group (Germany)	86,832
Hongkong A.R. Transmitting Society	76,680
DX Club of Slovania (Yugoslavia)	67,950
Warsaw Radioclub (Poland)	64,957
Rothwesten A.R.C. (Germany)	44,464
Bremerhaven Radio Club (Germany)	41,866
Nikola Telsa A.R.C. (Yugoslavia)	41,490
Japan DX Radio Club	38,700
QRJ DX Club (Japan)	29,430
Tiger Amateur Radio Club (Pakistan)	19,486
Uppsala Radioklub (Sweden)	14,280
Radio Club Valparaiso (Chile)	11,989
TSU DX Keyer's Club (Japan)	6,154
Mimasaka A.R.C. (Japan)	2,755
Helsinki Univ. A.R.C. (Finland)	1,225

Top Ten
ALL BAND—SINGLE OPERATOR

PY4OD	**796,740**		
UB5CI	766,108	UB5FJ	462,142
W3GRF	578,993	KP4AOO	445,060
9M4LX	494,910	9J2W	436,189
W4YHD	481,052	5A3TX	432,464
	HB9JG 425,541		

Top Six
MULTI-OPERATOR SINGLE TRANSMITTER

YV9AA	**1,046,025**	EL2AD	738,525
UA9DN	1,014,102	WA6SBO	589,937
VK5ZP	914,742	W7VGQ	572,736

MULTI-OPERATOR MULTI-TRANSMITTER

K2GL	**1,826,046**	DJ3JZ	936,936
W3MSK	1,508,700	DM7L	694,070
W4KXV	1,040,348	SM5CZQ	682,962

U.S.A. Runners-up

All Band	WA4NGO	402,462
21 Mc	W8WZ	35,615
14 Mc	W1BPW	186,333
7 Mc	W8FGX	90,906
3.5 Mc	K6BPR	5,440
1.8 Mc	W1BB/1	1,116

Continental Leaders
SINGLE BAND

21 Mc		4X4FA	174,505
ZS6IW	405,460	W6AM	161,991
K1NOL	44,544	IT1TAI	115,346
UA9VB	38,142	PY4AP	81,673
G3HCT	35,773	VK3ADB	15,660
VK4EL	16,297		
PY5EG	16,254		
14 Mc		**3.5 Mc**	
CX2CO	**435,732**	4X4DH	55,440
9J2VB	303,420	M1ZG	34,750
W4KFC	266,631	VE3AU	13,908
JA1BWA	164,300	VK3XB	1,443
KH6EPW	161,667		
DJ2BW	153,036	**1.8 Mc**	
7 Mc		OK1ZC	3,060
5A1TW	**227,814**	VE2UQ	2,626

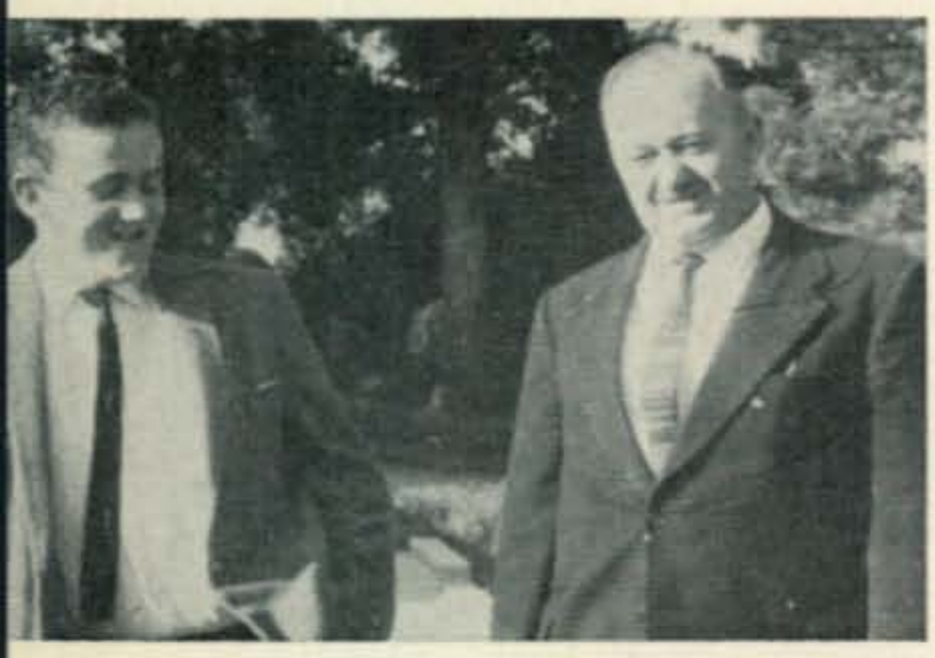
Number groups after call letters denote the following: Band, (A-all); Final Score; Number of QSOs; Zones and Countries. Certificate winners are listed in **bold face.**

C. W. Results
SINGLE OPERATOR
North America
United States

K1HVV	**A**	**214,920**	**378**	**67**	**132**
W1JYH	"	67,100	180	34	88
W1QAK	"	60,711	158	54	93
W1UUK	"	40,448	130	47	81
W1WY	"	21,975	119	26	49
W1BFA	"	8,008	52	24	32
W1PLJ	"	3,312	34	19	27
K1NOL	**21**	**44,544**	**167**	**26**	**70**
W1BIH	"	32,088	137	24	60
K1RQE	"	12,936	71	23	43
W1BPW	**14**	**186,333**	**476**	**33**	**100**
WA1ANR	"	9,558	56	18	41
W1AWE	"	3,564	36	11	22
W1YNE	"	1,296	20	6	18
W1SWX	3.5	24	2	2	2
W1BB/1	**1.8**	**1,116**	**32**	**4**	**8**
K2SUX	**A**	**185,771**	**339**	**71**	**126**
WA2OJD	"	104,468	234	54	110
WB2FIT	"	43,375	132	48	77
K2GDP	"	31,314	109	35	67
W2QDY	"	25,200	112	31	53
W2NEP	"	8,400	51	27	43
W2HL	"	6,027	44	18	31
WA2IZS	"	3,150	35	17	25
W2WZ	**21**	**24,258**	**120**	**23**	**55**
WA2ZEZ	"	21,973	108	24	49
WA2BUH	"	3,822	38	15	27
K2SHZ	**14**	**79,458**	**238**	**32**	**82**
WA2EFN	"	3,379	38	10	21
W2SDB	"	2,016	24	10	18
K2KD	"	1,485	19	8	19
K2OEA	"	1,296	19	10	17
W2CKR	"	160	6	4	6
WA2KSD	**7**	**20,770**	**127**	**18**	**44**
K2LTY	"	2,343	26	13	20
W2EQS	**1.8**	**423**	**38**	**4**	**5**
W3GRF	**A**	**579,993**	**665**	**96**	**213**
W3BES	**A**	**245,514**	**361**	**79**	**170**
W3KT	**A**	**112,896**	**239**	**52**	**116**
W3MCG	"	108,108	214	69	113
W3QQL	"	86,394	205	54	100
W3MSR	"	80,172	210	56	97
W3GRS	"	76,760	181	50	102
W3QMZ	"	73,688	187	57	94
W3GHD	"	60,604	192	34	75
W3YLJ	"	54,538	156	49	85
W3EVW	"	48,641	137	50	77
W3CGS	"	48,240	139	40	80
W3HHK	"	47,214	130	49	80
K3KMO	"	40,120	126	45	73
W3PN	"	36,771	123	31	72
W3BIP	"	33,060	103	39	75
W1QMM/3	"	19,264	85	35	51
W3CAA	"	18,723	81	29	50
WA3BAS	"	17,962	75	38	50
W3KDF	"	16,133	80	27	46
W3AXW	"	14,940	72	36	47
W3ALB	"	7,722	55	19	35
K3MCO	"	6,890	49	23	30
W3ISE	"	3,268	29	18	24
W3DRD	"	100	6	5	5
W3AFM	**14**	**125,498**	**328**	**33**	**98**
W3MFJ	"	73,564	244	30	76
W3BYX	"	53,088	193	27	69
W3CCH	"	14,148	130	19	35
W3ORU	"	5,895	60	16	29
W3UVH	**7**	**4,995**	**50**	**16**	**29**
W3EQA	"	1,274	17	11	15
W3ZQ	"	576	12	7	11
W4YHD	**A**	**481,052**	**538**	**96**	**223**
WA4NGO	**A**	**402,462**	**546**	**80**	**181**
W4BVV	**A**	**222,480**	**378**	**71**	**135**
WA4OAE	"	202,176	309	72	136
K4BAI	"	200,790	332	78	152
K4EZ	"	121,089	258	64	117
K4VWH	"	114,912	224	66	123
K4SHB	"	100,368	218	59	105
W4OPM	"	73,602	183	43	98
K4LPW	"	58,374	149	55	86
WA4CGA	"	43,260	134	56	84
W4GF	"	37,290	122	39	71
W4PTR	"	36,840	117	48	72
W4RVW	"	30,629	108	41	68
W4ZM	"	28,224	96	39	63
W4OMW	"	25,650	111	34	61
W4LRN	"	16,007	72	38	53
K4NMN	"	14,007	62	36	51
W4WBC	"	11,895	72	24	41
WA4MSU	"	11,060	57	29	41
K4YFQ	"	5,994	37	21	33
W4UWS	"	442	10	7	10
WA4SUR	**21**	**21,637**	**99**	**25**	**52**
W4HKJ	"	11,457	61	26	41
W4NTE	"	6,273	48	21	30
W4ORT	"	4,725	37	17	28
W4KFC	**14**	**266,631**	**644**	**34**	**107**
W4MR	"	71,269	187	31	90
W4LVV	"	64,460	210	30	80
W4SNU	"	63,558	224	27	72
W4YGY	"	21,996	98	24	54
K4RZK	"	16,644	70	22	54
W4IF	"	8,232	58	16	33
W4SHJ	**3.5**	**1,020**	**22**	**7**	**13**
W5BRR	**A**	**147,911**	**257**	**76**	**135**
W5LJT	"	14,110	62	34	51
WA5ABG	"	2,485	26	13	22
W5KC	**21**	**19,789**	**103**	**25**	**52**
W5LEF	"	8,639	61	19	34
WA5AMV	"	1,760	23	14	18
W5LGG	**14**	**85,125**	**243**	**35**	**90**
K8DPB/5	"	16,884	96	20	47
W5WZQ	**7**	**46,350**	**183**	**29**	**61**
K5TYP	"	15,478	90	29	42
K5JVF	**3.5**	**556**	**19**	**7**	**9**
W6RW	**A**	**378,460**	**524**	**97**	**157**
W6KG	**A**	**217,672**	**419**	**77**	**105**
W6ITA	"	178,848	331	68	116
K6SEN	"	156,615	310	73	124
W6IBD	"	129,961	275	72	97
W6NIX	"	121,239	264	68	103
W6GRX	"	92,220	203	65	94
W6ERS	"	64,172	171	55	67
W6NKR	"	42,250	121	53	77
K6HOR	"	36,920	126	43	61
W6BUD	"	21,535	100	31	42
WB6MMJ	"	16,280	107	29	26
W6KHS	"	14,664	115	36	42
WA6VAT	"	8,216	56	22	30
WA6DMN	"	5,712	46	18	24
WB6CUU	"	3,397	33	20	23
W6YLL	"	2,200	30	11	44
WB6BBC	"	1,005	23	7	8
W6BSY	**21**	**21,828**	**115**	**23**	**45**
WA6UZA	"	16,072	103	21	35
W6RGG	"	8,600	76	17	26
W6MSM	"	7,876	60	20	22
W6KNE	**14**	**44,405**	**189**	**30**	**53**
K6LEB	"	30,800	136	27	53
WA6GLD	"	20,672	111	23	41

Karl, OE3TL, receiving lunch from the XYL while the other two members of the team are keeping the ball rolling, OE1-1428 at the operating position and OE3LI "spotting."

JA1BUI—This must have been during a field day operation, doubt if this was the set-up during our contest.



The father/son team of Jeff and Tubby Vale at VK5ZP who in the past few years have proven that it's possible to come up with a top score from "Down Under."

WA6KNE	"	7,599	52	16	35
W6BIL	"	3,075	35	17	24
WB6MEQ	"	180	7	4	5
W6AM	**7**	**161,991**	**468**	**37**	**86**
K6AHV	"	60,726	245	33	54
W6EPZ	"	50,224	203	30	56
W6FSJ	"	31,710	162	28	42
W6LCX	"	22,260	129	28	32
K6IEC	"	2,650	38	12	13
WB6JMQ	"	234	9	6	7
K6BPR	**3.5**	**5,440**	**75**	**13**	**19**
W6JTB/6	**1.8**	**30**	**20**	**3**	**2**
W7ESK	**A**	**316,680**	**488**	**90**	**142**
W7VY	"	218,241	435	75	102
W7DLR	"	15,343	82	28	39
W7BTH	"	5,400	45	24	30
WA7ABW	"	5,365	56	16	21
K7CPC	"	4,788	52	17	19
W7POU	"	1,326	17	13	13
W7JRI	"	1,044	20	9	9
K7UCH	**14**	**54,610**	**226**	**32**	**54**
W7LVI	"	21,299	124	24	35
K7CAD	**7**	**8,080**	**74**	**19**	**21**
W6RST/7	"	7,718	83	14	20
W7MX	"	3,504	50	11	13
W7JLU	**3.5**	**2,646**	**44**	**14**	**13**
W8JIN	**A**	**401,579**	**463**	**100**	**213**
W8DGP	"	121,256	248	66	213
WA8CZH	"	72,358	189	54	89
W8SYR	"	68,211	176	49	94
W8JJW	"	23,638	79	44	62
K8SWE	"	8,215	53	15	38
W8WZ	**21**	**35,615**	**150**	**25**	**60**
W8UCI	"	14,190	81	23	43
W8VND	"	10,032	69	21	36
W8VSK	**14**	**110,814**	**284**	**36**	**102**
W8RLT	"	105,524	286	32	92
K8ANA	"	70,299	227	29	78
W8RXY	"	55,528	216	26	62
W8HUD	"	50,300	176	29	71
W8EW	"	23,025	111	23	52
K8AEX	"	20,069	121	19	42
K8CXM	"	17,199	97	22	41
W8KC	"	5,530	54	12	23
W8TRN	"	4,884	42	15	19
WA8EWT	"	1,484	22	11	17
W8FGX	**7**	**90,906**	**296**	**30**	**79**
K8NMG	"	3,040	29	17	23
W9IOP	**A**	**245,752**	**460**	**71**	**150**
WA9AXX	"	4,788	46	14	24
W9QWM	"	3,580	45	21	24
W9VSO	"	3,531	36	14	19
WA9GYZ	28	6	1	1	1
W9AQW	**14**	**96,096**	**300**	**31**	**81**
W9SCZ	"	24,696	103	25	59
WA9IUL	"	2,822	33	14	20
K9VQK	"	392	11	6	8
K9DTB	"	300	10	7	8
W9HUZ	**7**	**25,575**	**123**	**24**	**51**
W9YYG	"	22,876	112	24	52
W9PNE	**3.5**	**2,470**	**44**	**10**	**16**
WØGNX	**A**	**34,720**	**134**	**48**	**64**
WØLBB	"	19,602	91	37	44
KØJPL	"	13,950	64	42	48
WØTDR	"	11,968	64	26	42
WØTCX	**21**	**16,077**	**86**	**24**	**45**
WØLBS	"	5,865	45	21	30
WAØIFJ	"	266	8	6	8
WØAIH	**14**	**60,562**	**203**	**32**	**75**
KØKKU	"	53,910	209	29	61
WØGDX	"	40,702	151	32	62
WØVBQ	"	36,177	140	30	63
WAØEMS	"	34,944	150	26	58
WØEQN	"	23,560	130	25	51
KØZBO	**7**	**10,260**	**90**	**21**	**33**

Bahamas

VP7BG	**A**	**208,000**	**833**	**48**	**77**

Barbados

VP6BW	**A**	**65,280**	**629**	**21**	**30**
VP6AT	**7**	**6,696**	**135**	**8**	**16**

Bermuda

VP9EP	**A**	**30,400**	**298**	**24**	**26**
VP9FT	**7**	**3,962**	**141**	**7**	**7**

British Honduras

VP1TA	**14**	**29,498**	**330**	**17**	**26**

Canada

VE1EK	**A**	**5,265**	**57**	**20**	**25**
VE1TG	**21**	**12,040**	**147**	**17**	**23**
VE1ACE	"	1,008	74	4	3
VE1DB	14	1,690	26	11	15
VE2NV	**A**	**215,912**	**451**	**66**	**131**
VE2ATU	"	50,112	220	34	62
VE2AZQ	**3.5**	**390**	**40**	**3**	**2**
VE2UQ	**1.8**	**2,626**	**102**	**6**	**7**
VE3BWY	**A**	**19,923**	**109**	**40**	**47**
VE3AXF	"	14,982	88	27	41
VE3BMB	**21**	**3,774**	**54**	**15**	**19**
VE3ES	**14**	**13,090**	**90**	**20**	**35**
VE3AU	**3.5**	**13,908**	**166**	**11**	**27**
VE3ABG	**1.8**	**1,140**	**70**	**5**	**5**
VE4OX	**14**	**4,880**	**44**	**18**	**22**
VE6VO	A	2,079	28	12	15
VE7BDJ	**A**	**45,710**	**308**	**33**	**37**
VE8BB	"	1,890	64	9	6

Dominican Rep.

HI8WSR	**A**	**189,162**	**811**	**45**	**68**

Jamaica

6Y5MJ	**A**	**52,546**	**600**	**21**	**22**

Mexico

XE1PJ	**21**	**10,920**	**130**	**18**	**21**

Puerto Rico

KP4AOO	**A**	**445,060**	**935**	**78**	**160**
KP4BPH	21	2,424	102	7	5
KP4BBN	**14**	**65,264**	**384**	**22**	**51**

Africa

Angola

CR6AI	**A**	**253,581**	**499**	**54**	**127**
CR6GS	"	19,188	125	17	35

Cape Verde Is.

CR4BB	**A**	**120,274**	**265**	**57**	**85**

Crozet Is.

FB8WW	**A**	**7,228**	**63**	**22**	**30**

Kerguelen Is.

FB8XX	**A**	**61,560**	**180**	**37**	**71**

Libya

5A3TX	**A**	**432,464**	**816**	**52**	**127**
5A1TW	**7**	**227,814**	**918**	**22**	**64**

Madagascar

5R8AM	**14**	**13,728**	**109**	**20**	**28**

Morocco

CN8GB	**A**	**193,371**	**505**	**40**	**89**

Mozambique

CR7IZ	**A**	**166,926**	**457**	**49**	**80**
CR7HC	"	3,016	41	14	15
CR7CD	**14**	**7,279**	**90**	**14**	**15**

Republic of Congo

9Q5AB	**A**	**276,000**	**602**	**56**	**114**
9Q5QR	"	195,888	384	54	122
9Q5TJ	**21**	**80,636**	**343**	**24**	**52**
9Q5HD	**14**	**51,904**	**278**	**23**	**41**

Reunion Island

FR7ZD	**A**	**195,132**	**502**	**49**	**89**

Rhodesia

ZE3JJ	**21**	**39,837**	**276**	**16**	**33**
ZE8JO	**14**	**41,602**	**232**	**25**	**37**
ZE2KV	"	8,684	78	20	32
ZE3JO	"	6,556	60	16	28

Sierra Leone

9L1TL	**21**	**95,432**	**413**	**23**	**56**

Somalia

6O6BW	**A**	**323,188**	**648**	**56**	**116**

South Africa

ZS6AJD	**A**	**197,946**	**545**	**44**	**82**
ZS1O	"	552	16	7	5
ZS6IW	**21**	**405,460**	**1236**	**30**	**80**
ZS2HI	**14**	**105,340**	**406**	**27**	**65**
ZS6AJQ	"	57,032	279	23	49
ZS5UP	"	38,637	180	25	56

Uganda

5X5IU	**14**	**86,800**	**373**	**30**	**50**

Zambia

9J2W	**A**	**436,189**	**888**	**59**	**110**
9J2JG	"	23,030	131	28	42
9J2BC	**21**	**76,692**	**312**	**25**	**59**
9J2VB	**14**	**303,420**	**796**	**34**	**96**

Asia

Bahrain Is.

MP4BEK	**14**	**61,894**	**304**	**21**	**58**

Ceylon

4S7NE	**A**	**78,650**	**230**	**53**	**77**
4S7DA	**14**	**6,255**	**65**	**18**	**27**

Cyprus

ZC4TX	**3.5**	**7,588**	**110**	**6**	**22**

Hong Kong

VS6FF	A	28,272	250	29	47
VS6AJ	14	76,680	351	30	78

India

VU2RM	A	60,784	202	46	85
VU2CK	14	32,823	228	22	41

Iran

EP2RC	A	396,893	615	56	161

Israel

4X4MR	21	35,154	198	18	44
4X4FA	7	174,505	781	25	60
4X4DH	3.5	55,440	301	14	49

Japan

JA1VX	A	291,519	606	71	106
JA1CG	A	145,470	424	55	75
JA7AD	"	78,859	290	49	58
JA2WB	"	38,700	184	42	48
JA1EFG	"	25,004	148	37	59
JA1PT1	"	12,833	110	22	19
JA2PY	"	12,476	104	24	24
JA8SW	"	12,096	94	28	28
JA1AIU	"	10,442	115	21	25
JA1ORM	"	7,661	76	23	24
JA1DUH	"	6,468	64	22	20
JA1MIN	"	5,712	83	18	16
JA7MJ	"	5,048	62	20	21
JA7CPE	"	3,610	52	18	20
JA4AKL	"	2,755	49	13	16
JA8BB	"	2,312	34	16	18
JA4FM	"	1,376	24	16	16
JA6YBR	"	950	29	13	12
JA1HGY	28	110	7	5	5
JA6TQ	21	11,450	93	20	30
JA1KSO	21	10,335	105	18	21
JA7UJ	"	8,288	85	17	20
JA1LPZ	"	7,605	76	20	19
JA1HKP	"	6,201	65	18	21
JA7BMK	"	4,662	51	18	19
JA3DWT	"	4,000	54	15	17
JA2ETU	"	3,388	47	16	12
JA3DAY	"	2,996	45	14	14
JA1NLX	"	2,940	42	14	14
JAØACO	"	2,112	36	13	11
JA1CYV	"	1,950	32	13	12
JA1BWA	14	164,300	591	33	67
JA1CFD	14	58,433	300	26	45
JA2JW	14	54,366	244	31	51
JA6ACZ	"	40,920	220	26	40
JA1DFQ	"	34,440	226	23	33
JA3BN	"	32,835	222	23	32
JA5ACF	"	31,801	167	28	49
JA4BJO	"	30,532	183	25	43
JA1FDU	"	28,362	190	23	35
JA1IFP	"	28,080	218	23	31
JA7MN	"	24,440	203	20	27
JA8GR	"	21,981	172	22	29
JA1HOM	"	15,861	136	21	30
JA3BVG	"	12,180	119	19	23
JA2ANX	"	12,006	78	26	32
JA1CXC	"	11,979	148	15	18
JA1BAU	"	9,792	102	18	18
JA6PN	"	9,760	92	18	22
JA8AJM	"	9,494	100	21	26
JA1IFB	"	9,239	110	17	20
JA2TH	"	9,016	81	20	26
JA1AKH	"	8,502	105	18	21
JA1EL	"	5,232	71	20	28
JA2CVK	"	5,046	76	14	15
JA3CEV	"	4,896	61	16	16
JA3EOP	"	4,712	50	19	19
JA8YAU	"	4,407	55	17	22
JA4AQR	"	4,148	66	17	17
JA7AKC	"	3,185	45	16	19
JA3HLJ	"	2,125	40	11	14
JA2PH	"	1,320	35	10	11
JA2TY	"	990	28	10	12
JA4ABN	"	980	24	9	11
JA2QS	"	240	11	8	8
JA1AEA	7	69,264	365	27	45
JA1YL	7	62,530	335	27	38
JA1IBX	"	30,030	182	25	41
JA7AKQ	"	14,455	124	21	28
JA1LWI	"	12,669	110	17	24
JA2DCN	"	9,225	87	21	24
JA1KUU	"	8,296	90	16	18
JA7XF	"	7,128	83	17	19
JA1PVK	"	3,504	63	12	12
JA6AKL	"	2,565	48	13	14
JA2CBK	"	704	31	6	5
JA2BVS	"	680	30	5	5
JA8AE/1	"	620	22	5	5
JA1JQY	"	590	31	5	5
JA1JWM	"	440	29	4	6
JA3BCT	"	90	7	3	3
JA6BWH	"	65	6	2	3
JA1MJA	"	6	1	1	1
JA1BK	3.5	3,567	49	13	16
JA1LDM	"	663	21	8	9
JA3AA	1.8	3	6	1	2
KA2CM	14	21,443	205	20	21

Korea

HM1BB	A	22,066	193	24	35
HL9KA	"	12,282	107	20	26
HL9KB	"	5,688	116	16	20

Malaysia

9M4LX	A	494,910	684	86	184
9M4LP	A	406,032	683	97	167
9M4JW	14	26,625	165	26	45
9M4JY	"	24,640	171	27	50

Mongolia

JT1AJ	14	960	40	9	11
JT1KAE	"	885	37	7	8

Lebanon

OD5LX	A	162,526	426	39	94

Pakistan, East

AP5CP	14	4,120	73	17	23

Pakistan, West

AP5HQ	14	15,376	110	20	42

Ryukyu Is.

KR6BQ	A	384,385	760	84	131
KR6OJ	"	315,168	855	57	90
KR6JZ	14	32,768	209	26	38
KR8AG	"	3,875	73	15	16

U.S.S.R.

Armenia

UG6AD	7	18,146	150	9	34
UG6AV	"	1,938	39	5	12
UG6AI	"	992	22	5	11

Asiatic

UA9EU	A	16,995	107	19	36
UA9FM	"	16,422	95	19	50
UA9TP	"	5,372	54	9	25
UA9SH	"	459	11	9	8
UA9VB	21	38,142	237	23	55
UW9WB	"	8,732	76	15	33
UA9BZ	14	41,730	242	16	49
UA9FJ	"	19,320	105	19	51
UW9CS	"	10,212	90	13	33
UA9DK	"	9,367	112	7	22
UA9FV	"	8,680	87	8	27
UA9VJ	"	8,448	99	18	26
UA9VA	"	8,240	100	12	28
UA9WZ	"	3,952	54	8	18
UA9KJA	"	2,530	38	6	17
UA9KJA	"	2,373	39	6	15
UA9WS	7	62,685	355	17	46
UA9HA	"	34,907	230	20	47
UA9AC	3.5	17,568	188	8	26
UA9KWA	"	16,416	155	7	31
UA9CM	"	8,288	103	7	21
UA9RD	"	4,100	62	8	17
UAØAG	A	52,565	224	31	68
UAØGF	"	20,718	229	32	30
UAØLJ	"	17,034	178	23	28
UAØMQ	"	9,535	165	17	20
UAØMI	"	7,912	117	21	25
UAØLS	"	5,562	146	13	14
UAØBU	"	5,200	85	14	28
UAØCC	"	1,740	57	10	10
UAØML	"	1,720	52	8	12
UAØLL	"	744	22	7	5
UAØLH	14	13,095	148	18	27
UWØIX	"	8,160	115	15	17
UAØNA	"	7,194	114	14	19
UAØGM	"	5,550	64	17	20
UAØJW	"	1,581	67	8	9

Azerbaijan

UD6BD	A	39,852	141	28	80
UD6BN	"	15,435	164	16	29
UD6AY	"	14,454	91	22	44
UD6FA	"	1,680	28	8	20
UD6AM	21	20,300	172	17	41
UD6BZ	14	66,490	227	30	79
UD6AX	"	31,563	189	17	46
UD6BW	7	9,348	94	10	28
UD6GF	"	2,363	60	4	13

Georgia

UF6KAE	7	10,582	138	5	21

Kazakh

UL7JE	A	150,540	489	38	84
UL7CH	"	100,152	350	31	76
UL7LK	"	46,793	237	23	50
UL7IR	"	19,272	111	19	47
UL7HV	"	13,056	101	15	33
UL7KBA	14	3,900	56	10	20

Tadzhik

UJ8AH	A	25,710	146	20	45

Turkoman

UH8AA	A	284,240	520	59	150
UH8BO	14	33,001	213	17	44
UH8CR	"	10,982	112	8	26

Uzbek

UI8LB	A	225,063	546	45	108
UI8AI	21	4,828	52	12	22
UI8LC	7	21,956	194	12	32
UI8BZ	"	5,536	59	7	20

Europe

Aland Island

OHØNH	A	3,510	72	16	29
OHØNI	"	780	22	11	15
OHØNJ	"	672	35	6	15

Austria

OE1ZK	A	77,724	409	38	89
OE1TT	14	24,696	98	32	66
OE1KU	1.8	261	29	3	6

Channel Is (Jersey)

GC4LI	A	28,938	180	28	50

Bulgaria

LZ1DV	A	49,178	232	42	92
LZ2HK	"	16,472	198	20	51
LZ1KPB	"	630	33	6	15
LZ1CF	21	10,502	60	23	36
LZ1KDP	"	5,520	49	17	29
LZ1CW	"	3,572	55	14	24
LZ1AG	14	15,399	157	18	41
LZ2VB	"	10,498	107	18	40
LZ1KAI	7	33,215	407	15	50
LZ2AW	"	16,758	266	10	39
LZ2KSU	"	8,987	176	9	34
LZ1KKR	"	7,236	169	11	25
LZ1KSM	"	5,708	162	8	25
LZ1KKZ	"	4,920	93	8	32
LZ2KAF	"	3,630	99	8	22
LZ2KDC	"	3,103	98	6	23
LZ2GS	"	3,100	92	6	25
LZ2DK	"	2,291	78	7	22
LZ2KPD	"	2,001	63	7	22
LZ1MK	"	1,976	66	6	20
LZ1DZ	3.5	22,360	389	9	43
LZ1BK	"	9,044	250	6	28
LZ2KBA	"	5,808	163	6	27
LZ2KHN	"	288	24	4	8

Czechoslovakia

OK1BY	A	179,985	494	53	116
OK1IQ	A	179,469	550	53	154
OK1AFC	A	169,261	451	66	147
OK3CBR	"	129,195	521	51	114
OK2QX	"	118,825	486	52	123
OK2KGD	"	104,975	366	52	115
OK1PD	"	90,540	248	63	117
OK1ABP	"	78,208	366	41	87
OK1SV	"	59,451	209	44	89
OK1ADM	"	39,406	187	40	82
OK2LN	"	30,576	186	30	82
OK2BEN	"	29,930	215	22	60
OK1AFN	"	23,712	317	14	62
OK3CCC	"	23,208	145	30	64
OK2BBI	"	20,726	163	30	56
OK2ABU	"	16,946	185	21	53
OK1OO	"	13,020	143	14	48
OK2BEC	"	10,497	96	15	42
OK2BFT	"	5,324	104	14	30
OK2AJ	"	4,366	116	8	29
OK2BCI	"	4,004	39	21	31
OK2OL	"	3,922	48	17	36
OK1TW	"	2,925	53	13	26
OK1ZW	"	2,200	49	10	30
OK2BCZ	"	1,880	41	11	29
OK1AAZ	"	1,050	25	11	19
OK2KFK	"	60	12	3	7
OK1GT	21	26,026	130	55	22
OK1MX	"	4,961	44	17	24
OK3IC	"	3,536	36	13	21
OK2BEJ	"	2,236	32	11	15
OK1MP	"	640	13	10	10
OK1ZL	14	136,160	492	30	85
OK1IK	"	48,887	290	27	56
OK3OM	"	37,931	215	26	57
OK1BMW	"	37,164	213	23	53
OK3CAO	"	13,616	162	15	31
OK3CCT	"	2,914	34	16	15
OK3UI	7	67,053	478	24	69
OK1ZQ	"	24,633	268	16	47
OK2BDY	"	2,952	48	10	26
OK1PG	"	2,268	65	8	20
OK1ADH	"	572	26	6	16
OK1AEH	"	272	15	5	11
OK1MG	3.5	32,640	401	11	49
OK2RO	3.5	12,420	255	8	38
OK2KR	"	10,215	208	7	38
OK2KHF	"	8,550	261	6	32
OK2BEH	"	6,228	174	5	31
OK1AT	"	5,616	141	7	32
OK2BFX	"	4,624	126	5	29
OK2BGH	"	4,046	113	6	28
OK3CFI	"	2,050	83	4	21
OK2KVI	"	1,800	84	4	20

OK3CEV	"	1,606	80	4	18
OK1AIL	"	1,081	55	5	18
OK2KOV	"	860	53	4	16
OK1ALG	"	770	35	3	19
OK2BEY	"	420	45	4	10
OK2BGV	"	120	16	3	7
OK3CFS	"	30	10	2	4
OK1ZC	**1.8**	**3,060**	**167**	**5**	**15**
OK1WT	"	1,545	110	3	12
OK3CFP	"	736	52	3	13
		Denmark			
OZ4RT	**A**	**65,940**	**275**	**48**	**109**
OZ1LO	"	25,896	222	26	57
OZ7BW	"	11,932	112	25	51
OZ4DX	"	10,368	123	17	37
OZ4H	"	4,410	70	16	26
OZ5DX	**14**	**27,023**	**181**	**22**	**39**
OZ1TL	**3.5**	**6,240**	**106**	**8**	**40**
		England			
G2DC	**A**	**148,176**	**343**	**54**	**142**
G8FC	"	127,565	414	50	105
G3FTQ	"	33,853	235	28	69
G2AJB	"	23,556	154	27	51
G3HZL	"	23,115	140	40	75
G3DXY	"	29,944	284	21	55
G3MWZ	"	12,408	114	22	44
G3NVK	"	8,448	80	23	43
G3HCT	**21**	**35,773**	**175**	**26**	**57**
G3FKM	**14**	**110,635**	**372**	**32**	**77**
G3PJW	"	20,475	280	14	31
G8DI	"	5,472	99	9	29
G3RJB	"	1,536	55	6	64
G3HDA	**7**	**43,368**	**357**	**23**	**63**
G3DDY	"	29,944	284	21	55
G3ESF	"	20,436	329	13	39
G3GGS	"	13,395	173	16	41
G3OLN	"	3,480	60	13	27
G3RAU	**1.8**	**1,660**	**71**	**4**	**16**
G5MP	"	312	28	2	10
		Finland			
OH2PM	**A**	**185,430**	**507**	**63**	**147**
OH5VF	**A**	**48,816**	**356**	**51**	**120**
OH3ZN	"	46,035	245	33	108
OH4OP	"	23,358	138	33	69
OH2YL	"	11,704	71	27	49
OH3YI	"	11,661	150	20	49
OH5UQ	"	10,564	69	30	46
OH3AG	"	9,625	81	15	40
OH5PT	"	6,804	60	17	37
OH7NW	"	5,029	81	15	32
OH3QC	"	1,768	34	23	29
OH2AC	"	1,225	37	8	17
OH5TM	**21**	**3,162**	**23**	**13**	**17**
OH2BR	"	819	16	3	13
OH2CK	**14**	**30,798**	**165**	**26**	**61**
AH3XZ	"	16,815	174	18	39
OH2DW	"	6,212	111	10	32
OH9QU	"	3,675	91	10	25
OH3NR	"	3,564	89	9	18
OH2BBN	"	2,070	36	9	21
OH5RZ	"	1,380	30	8	15
OH1VR	"	900	20	9	11
OH2RD	"	45	5	4	5
OH1VA	**7**	**25,900**	**223**	**19**	**55**
OH5TS	"	24,771	267	18	51
OH2BAZ	"	16,131	232	13	44
OH9NV	"	13,862	183	15	43
OH2BDA	"	99	8	5	6
OH2BS	**3.5**	**16,560**	**299**	**8**	**40**
OH5VD	"	1,836	58	6	21
OH6RE	"	800	36	6	14
OH2BDN	"	256	16	9	7
OH3MF	"	140	15	3	7
OH2HK	**1.8**	**612**	**51**	**3**	**9**
OH3NY	"	300	30	2	8
		France			
F8TM	**A**	**103,320**	**371**	**49**	**115**
F3PK	"	95,976	323	46	83
F8OP	"	77,945	337	35	96
F3AT	"	43,030	153	44	86
F3JL	"	34,076	177	36	56
F2MA	**21**	**19,551**	**131**	**21**	**36**
		Germany			
DL7AA	**A**	**208,610**	**385**	**74**	**156**
DL8FR	**A**	**194,394**	**585**	**56**	**125**
DJ7IK	**A**	**183,624**	**600**	**53**	**119**
DJ2HH	**A**	**172,550**	**424**	**67**	**136**
DL9PU	"	123,145	376	55	102
DJ3CI	"	99,821	286	54	119
DL1JF	"	85,315	280	48	103
DJ3ZV	"	75,405	205	56	109
DL7BQ	"	70,080	304	39	81
DJ8IF	"	69,050	358	37	85
DJØPN	"	68,580	227	41	83
DL8AJ	"	54,712	244	37	87
DL1AM	"	45,784	216	31	87
DJ2NN	"	45,494	205	38	48
DL7HA	"	43,472	200	34	70
DL1ES	"	25,368	176	31	72
DL1IA	"	23,594	107	37	57
DJ4HR	"	22,102	162	25	61
DL1OW	"	20,940	197	22	38
DL7GF	"	18,000	104	34	56
DL7CF	"	17,670	125	28	65
DJ9MH	"	17,252	212	19	57
DL1XS	"	14,450	100	30	55
DJ2FL	"	14,352	164	17	52
DL1IP	"	5,415	82	18	39
DJ8FR	"	4,131	61	18	33
DJ7PB	"	3,375	87	7	20
DJ2UU	"	2,116	45	15	31
DJ2EL	"	1,092	19	12	14
DL8ANA	**21**	**4,400**	**40**	**15**	**25**
DL7EG	"	3,096	32	17	19
DJ2BW	**14**	**153,036**	**503**	**33**	**75**
DJØIK	"	123,552	497	34	74
DL6QWA	"	66,066	294	28	63
DJ2RE	"	21,056	150	20	36
DJ2XP	"	11,508	137	15	27
DJ5JH	**7**	**32,830**	**325**	**18**	**52**
DL7CW	"	10,498	115	14	44
DJ5GG	"	5,520	93	10	30
DJ9RY	"	4,050	107	7	23
DJ5DT	**3.5**	**18,981**	**243**	**12**	**45**
DL7AV	"	11,139	227	7	40
DL9CE	"	8,229	149	7	32
DL1JW	**1.8**	**2,784**	**192**	**3**	**13**
DJ5GW	"	120	20	2	4
DL4IM	**A**	**97,699**	**423**	**39**	**80**
DL4IO	"	1,560	46	11	19
DL5AO	**14**	**26,390**	**224**	**20**	**38**
DL4RM	"	10,944	125	13	23
DL5GU	"	5,358	79	15	23
DM2AND	**A**	**163,548**	**368**	**66**	**132**
DM3ZO	**A**	**30,770**	**212**	**29**	**54**
DM3SBM	"	16,791	115	32	55
DM2CEL	"	16,206	119	17	57
DM2BBK	"	13,804	137	23	45
DM2BDH	"	5,865	75	18	51
DM3RYO	"	3,936	64	18	23
DM2ATD	"	3,162	82	11	20
DM2BJD	"	1,680	24	12	16
DM3RBM	"	1,080	18	13	14
DM2BBE	"	276	15	5	7
DM3YF	"	56	8	3	4
DM2ATD	**21**	**9,932**	**68**	**21**	**31**
DM2BDN	14	660	30	7	8
DM3BN	**7**	**2,474**	**64**	**7**	**29**
DM2BXH	**3.5**	**1,007**	**55**	**4**	**15**
		Greece			
SVØWAA	**A**	**77,088**	**450**	**38**	**94**
		Hungary			
HAØHN	**A**	**37,904**	**286**	**28**	**75**
HA3GF	**A**	**33,488**	**227**	**30**	**82**
HA9PB	"	24,596	240	21	65
HA1VE	"	24,552	287	26	62
HA5FZ	"	20,381	205	23	66
HA1VA	"	11,264	153	17	47
HA3MB	"	11,088	94	25	52
HA3MJ	"	4,104	51	14	22
HA8UH	"	3,726	73	14	32
HAØLG	"	3,280	63	14	26
HA5AI	"	2,112	88	6	18
HA2MJ	"	1,960	40	13	22
HA5BI	**21**	**1,674**	**20**	**11**	**16**
HA3GA	**7**	**16,224**	**239**	**10**	**42**
HA1VF	**3.5**	**1,037**	**60**	**4**	**13**
		Iceland			
TF3AB	**A**	**20,475**	**195**	**18**	**27**
TF3KG	**14**	**6,600**	**90**	**12**	**21**
		Ireland			
EI2AT	**A**	**1,855**	**57**	**10**	**25**
		Italy			
I1KE	**A**	**137,618**	**560**	**37**	**97**
I1NT	"	125,020	500	37	96
I1ER	"	105	7	3	2
I1SOP	**14**	**1,265**	**43**	**6**	**17**
I1BAY	**7**	**31,521**	**488**	**14**	**43**
I1HL	"	1,708	50	8	20
		I. T. U.			
4U1ITU	**14**	**16,884**	**199**	**13**	**23**
		Netherlands			
PAØLOU	**A**	**34,832**	**170**	**37**	**75**
PAØVB	"	34,440	233	32	73
PAØFLX	"	11,144	158	15	41
PAØWAC	"	5,872	59	18	19
PAØSNG	**14**	**78,115**	**390**	**28**	**57**
		Northern Ireland			
GI3GAL	**A**	**23,166**	**156**	**28**	**53**
		Norway			
LA2Q	**A**	**23,306**	**185**	**22**	**64**
LA7GC	"	12,432	191	18	38
LA5HE	"	9,230	59	30	41
LA6U	"	6,816	75	19	52
LA7H	**21**	**2,294**	**37**	**15**	**22**
LA3UF	**14**	**6,642**	**86**	**12**	**29**
LA7UH	"	2,784	66	10	22
LA5IH	"	1,541	80	5	18
LA8WG	**7**	**2,884**	**99**	**5**	**23**
		Poland			
SP6AAT	**A**	**121,761**	**457**	**49**	**114**
SP2IU	**A**	**70,912**	**356**	**36**	**92**
SP6AKK	"	49,665	285	34	71
SP5AIB	"	23,023	177	25	66
SP6TQ	"	15,360	153	21	59
SP9ZD	"	12,204	130	14	40
SP2AEL	"	7,808	64	20	44
SP3PK	"	5,670	53	20	25
SP9AGS	"	3,696	88	10	23
SP9YP	"	2,788	64	11	25
SP6UK	"	2,565	58	12	33
SP1KJW	"	2,250	59	11	19
SP1HU	"	988	30	9	17
SP9EC	"	924	34	6	15
SP5YC	**21**	**7,293**	**50**	**19**	**32**
SP7HX	"	6,604	45	20	32
SP1JX	"	1,000	15	11	14
SP3AOT	"	893	19	8	11
SP7AOD	"	312	9	6	7
SP9DH	**14**	**30,874**	**163**	**25**	**61**
SP5AFL	"	7,134	84	13	28
SP3AK	"	1,976	40	8	18
SP5YL	"	1,272	23	9	15
SP5AHW	"	504	14	6	8
SP8CP	**7**	**27,864**	**264**	**20**	**52**
SP4TW	"	23,924	252	17	46
SP5ARN	"	20,800	231	17	47
SP5ZA	"	17,995	242	13	46
SP9AKY	"	8,132	174	11	27
SP8HR	"	2,720	70	8	24
SP5AGU	**3.5**	**13,600**	**324**	**6**	**34**
SP9AJN	"	4,212	160	5	21
SP9AWY	"	3,720	140	51	25
SP5KEU	"	360	24	4	11
		Roumania			
YO2BU	**A**	**392,688**	**668**	**98**	**226**
YO3LM	**A**	**154,875**	**544**	**54**	**121**
YO7DO	"	125,615	431	57	128
YO7DL	"	67,276	356	36	85
YO8DD	"	58,819	334	34	97
YO8GL	"	18,156	195	21	47

The 14 and 3.5 mc positions at OH2AA. That's OH2SB working the paddle on 20 and OH2BT on 80, with OH2FS having a bite to eat.

YO3KAA	"	11,703	169	13	34
YO5LN	"	6,048	96	10	32
YO2BA	"	5,628	107	17	25
YO5KDG	"	2,852	69	9	22
YO8HG	"	2,730	68	10	25
YO7VF	"	2,345	62	10	25
YO3JF	"	2,301	59	13	24
YO2AAF	"	1,860	62	9	22
YO5YT	"	1,200	23	12	13
YO2BZ	"	1,025	34	9	16
YO8AP	**21**	**7,536**	**57**	**18**	**30**
YO3ZM	**14**	**10,824**	**167**	**12**	**29**
YO8KAE	**7**	**60,076**	**425**	**27**	**67**
YO8GZ	**7**	**23,751**	**269**	**18**	**45**
YO6XI	"	20,358	298	13	41
YO3QO	"	5,617	105	10	31
YO7EL	"	5,187	112	10	29
YO7VS	"	3,888	99	8	28
YO8FR	"	2,805	65	9	24
YO3AAK	"	2,730	79	7	23
YO8OK	"	2,728	80	9	22
YO4SZ	"	2,610	64	8	21
YO9HI	"	2,604	73	7	21
YO3YZ	"	1,846	61	6	20
YO2FZ	"	1,512	53	5	23
YO6ADW	"	1,475	41	8	17
YO6XO	"	1,325	34	7	18
YO3ABE	"	1,320	57	5	17
YO3JW	"	1,175	36	6	19
YO6UV	"	1,152	40	7	17
YO6XK	"	1,128	44	5	19
YO8GP	"	714	28	6	15
YO6SD	**3.5**	**1,562**	**80**	**5**	**17**
YO5KBP	"	442	23	4	9

San Marino

M1ZG	**3.5**	**34,750**	**550**	**10**	**40**

Sicily

IT1AGA	**A**	**34,743**	**181**	**33**	**78**
IT1TAI	**7**	**115,346**	**764**	**27**	**80**

Spain

EA3KT	**A**	**54,392**	**295**	**30**	**74**
EA2CR	"	5,202	70	16	35
EA7LY	"	2,432	36	13	19
EA1IO	**14**	**11,868**	**128**	**11**	**32**

Sweden

SM5CCE	**A**	**181,545**	**534**	**53**	**142**
SM6CMU	**A**	**54,436**	**298**	**38**	**86**
SM5CEU	**A**	**54,282**	**320**	**39**	**70**
SM4CMG	"	38,850	183	39	72
SM3SV	"	27,744	167	31	65
SM7AXP	"	25,098	186	26	68
SM5API	"	14,280	111	19	37
SM5FT	"	10,260	162	13	41
SM6CMR	"	9,758	110	28	54
SL3AJ	"	7,332	132	13	36
SM7EH	"	5,450	70	18	32
SM6CKU/5	"	5,358	69	20	37
SM6BDS	"	4,136	66	16	28
SM3VE	"	4,104	51	21	36
SM6CAW	"	3,680	41	20	28
SM5CVH	"	3,660	49	17	30
SM6CKU/2	"	3,124	53	16	28
SM5KV	**21**	**17,280**	**94**	**23**	**49**
SM5CQT	"	3,848	40	14	23
SM7AAZ	"	1,060	21	10	10
SM5BLU	"	888	17	10	14
SM2DPB	"	128	8	4	4
SM5DIB	**14**	**40,346**	**283**	**20**	**44**
SM2CZT	**14**	**30,441**	**218**	**21**	**52**
SM2CXO	"	24,662	230	19	40
SM4AD	"	24,242	174	19	43
SM6APQ	"	16,960	163	17	23
SM5BEU	"	16,260	146	18	42
SM2RI	"	3,915	135	8	21
SM5AIO	"	1,472	45	7	16
SM7DVF	"	180	9	5	7
SM3TW	**7**	**28,728**	**290**	**21**	**55**
SM5CAK	**7**	**26,325**	**325**	**17**	**48**
SM5ARQ	"	8,988	196	10	32
SM5BUT	"	8,928	159	11	37
SM5DRB	"	6,426	140	9	33
SM5UQ	"	4,826	116	9	29
SM5DSF	"	3,920	100	8	27
SM3DNI	"	3,248	112	4	24
SM5MX	**3.5**	**17,442**	**312**	**9**	**42**
SM6APH	"	4,200	80	7	33
SM4DRD	"	555	38	4	11

Switzerland

HB9JG	**A**	**425,541**	**667**	**82**	**167**
HB9ZY	"	134,343	363	64	113
HB9MO	"	134,064	342	58	113
HB9QA	"	13,345	121	25	60
HB9KC	"	4,235	73	16	19
HB9UD	"	440	12	8	12
HB9DX	**21**	**1,539**	**22**	**11**	**16**
HB9ADB	**14**	**912**	**50**	**5**	**14**

Yugoslavia

YU3EI	**A**	**24,510**	**170**	**35**	**60**
YU2NEG	"	10,281	112	17	52
YU3AR	**21**	**2,444**	**34**	**11**	**15**
YU2AKL	**14**	**3,600**	**88**	**8**	**22**
YU3LB	**7**	**59,096**	**511**	**24**	**59**
YU1YG	"	8,010	162	11	34
YU1NGO	"	4,921	114	10	27
YU3EA	**3.5**	**8,626**	**237**	**6**	**32**

U.S.S.R.

Estonia

UR2FD	**A**	**7,632**	**101**	**14**	**39**
UR2AO	**7**	**6,162**	**133**	**7**	**32**
UR2GZ	**3.5**	**1,633**	**70**	**5**	**18**

European

UA4PA	**A**	**356,912**	**731**	**78**	**216**
UA3UJ	**A**	**189,841**	**445**	**57**	**172**
UA3DV	**A**	**147,684**	**477**	**52**	**134**
UA4YY	**A**	**127,800**	**444**	**53**	**127**
UA1RE	"	81,282	346	42	96
UA3XS	"	78,934	508	25	97
UA3BK	"	56,522	294	33	85
UA4DM	"	32,242	232	25	69
UA1KIL	"	26,933	151	25	79
UA4KED	"	17,845	135	28	55
UA1CX	"	17,316	144	28	50
UA3TA	"	15,762	140	20	54
UA3KFA	"	13,834	104	24	50
UA3RM	"	12,688	134	17	44
UA3KHY	"	10,740	142	13	47
UA6BV	"	9,869	88	22	49
UA3MX	"	9,512	127	20	38
UA3GM	"	8,100	30	10	12
UA3KOB	"	6,768	126	13	34
UA1SW	"	6,726	96	16	41
UA1ND	"	5,848	76	14	29
UA1DQ	"	4,680	86	14	31
UA3FD	"	4,050	43	22	32
UA6FC	"	3,698	72	11	32
UA3KLD	"	2,952	50	13	28
UW3CX	"	2,888	54	11	27
UA1BT	"	2,686	45	12	22
UA1DG	"	2,030	55	10	19
UW3CM	"	1,092	30	8	18
UA3AM	"	616	18	13	15
UA6JB	"	165	13	4	7
UA1DI	"	56	8	3	4
UA6FD	**21**	**6,996**	**117**	**12**	**32**
UA4PX	"	1,222	19	11	15
UA1MA	"	946	15	8	14
UA4DF	**14**	**60,096**	**320**	**29**	**67**
UA4CB	**14**	**43,492**	**266**	**26**	**57**
UA4QA	**14**	**42,873**	**257**	**22**	**71**
UV3TQ	"	35,880	286	20	58
UA3KHW	"	24,882	233	17	49
UA4CN	"	18,225	132	19	56
UA6KJG	"	17,759	204	16	43
UV3TC	"	13,515	168	14	37
UA1RV	"	10,579	184	16	43
UA3KFB	"	10,215	110	15	30
UA4QJ	"	8,058	100	14	37
UA1IN	"	6,417	139	9	22
UA1CI	"	6,105	92	10	27
UA6JJ	"	4,719	83	11	28
UA4ZA	"	3,567	59	10	31
UA3TI	"	3,032	67	8	28
UA3KMD	"	1,964	64	8	16
UA1DU	"	1,425	62	8	11
UA1DF	"	1,104	30	9	15
UA1HH	"	663	27	6	11
UW3BX	"	594	25	7	11
UA6FY	**7**	**9,266**	**210**	**7**	**34**
UA3YQ	**7**	**4,750**	**125**	**7**	**31**
UA6FL	"	4,560	90	8	30
UA3AY	"	3,663	101	9	24
UA3QI	"	391	19	5	12
UA3KSV	"	252	14	6	8
UA3WX	"	210	16	5	10
UA3OI	"	117	8	3	6
UA1DH	**3.5**	**14,036**	**237**	**9**	**35**
UA1NA	"	13,254	221	7	39
UA4PW	"	8,733	181	7	34
UA1DX	"	1,180	54	4	16

Kaliningrad

UA2WJ	**A**	**1,998**	**45**	**10**	**17**

Latvia

UQ2FJ	**A**	**2,006**	**61**	**7**	**27**
UQ2GA	**14**	**12,006**	**130**	**15**	**31**
UQ2CC	"	84	4	3	4
UQ2KAT	**7**	**10,388**	**152**	**15**	**38**
UQ2KHL	"	585	39	4	11

Lithuania

UP2OK	A	990	41	8	14
UP2OM	**14**	**21,170**	**185**	**16**	**42**
UP2CV	"	154	10	5	6
UP2PT	**7**	**25,675**	**340**	**16**	**49**
UP2AW	"	2,639	84	7	22
UP2KDA	**3.5**	**1,743**	**80**	**5**	**16**
UP2OO	"	1,058	43	5	18

Moldavia

UO5BM	**A**	**149,034**	**466**	**53**	**124**
UO5RO	"	6,678	110	15	38
UO5AA	"	5,334	91	14	28

Ukraine

UB5CI	**A**	**766,108**	**874**	**108**	**300**
UB5FJ	**A**	**462,142**	**1004**	**73**	**196**
UB5OD	**R**	**118,611**	**389**	**48**	**143**
UT5CJ	A	116,808	333	53	133
UT5HP	"	114,840	438	43	121
UB5PI	"	85,478	309	47	111
UT5BX	"	81,624	347	40	112
UB5IU	"	55,085	349	30	115
UB5LW	"	47,214	219	38	91
UY5MG	"	17,499	218	17	40
UT5HE	"	16,120	182	17	48
UB5YN	"	9,802	135	15	43
UT5NA	"	9,306	131	16	50
UB5QA	"	8,305	99	17	38
UB5AE	"	7,552	86	16	43
UB5GT	"	7,314	107	13	40
UB5ZO	"	6,600	92	15	35
UT5EW	"	5,886	50	16	33
UB5TR	"	4,816	60	16	27
UB5ZE	"	4,738	75	14	32
UT5GR	"	3,567	80	10	31
UB5WO	"	2,279	33	15	28
UB5NW	"	2,144	51	11	21
UB5KMX	"	1,550	40	9	22
UB5KVF	"	638	25	6	16
UB5FL	"	550	25	10	15
UB5ES	"	418	12	8	11
UT5FG	21	153	13	3	6
UB5TQ	"	84	4	3	4
UB5LU	**14**	**83,174**	**440**	**26**	**65**
UT5RB	"	29,011	290	18	49
UT5BW	"	22,984	155	20	48
UB5OA	"	7,525	111	11	32
UB5QE	"	2,016	56	7	21
UT5EH	**7**	**30,418**	**324**	**17**	**50**
UB5LM	"	11,908	163	11	41
UT5BP	"	6,594	63	10	32
UB5KNF	"	945	27	6	15
UB5KDS	**3.5**	**22,450**	**402**	**9**	**41**
UB5DQ	"	16,276	268	11	41
UB5HS	"	9,918	243	6	32
UB5EF	"	5,445	158	6	27
UT5RR	"	1,386	64	5	17

White Russia

UC2WP	**A**	**35,854**	**264**	**24**	**67**
UC2BF	"	11,484	105	20	46
UC2TA	"	1,100	40	9	16
UC2BB	"	496	13	6	10
UC2AW	**14**	**7,182**	**75**	**18**	**36**
UC2AR	**7**	**7,310**	**132**	**11**	**32**
UC2IB	"	920	42	5	15
UC2KGD	"	204	17	4	8

Oceania

Australia

VK2GW	**A**	**323,050**	**641**	**67**	**108**
VK2PV	"	58,776	217	38	55
VK2RA	"	2,296	32	13	15
VK2APK	**14**	**116,982**	**424**	**26**	**71**
VK3AXK	**A**	**49,476**	**243**	**38**	**38**
VK3TL	"	10,887	66	20	37
VK3RJ	**21**	**9,612**	**94**	**15**	**21**
VK3ADB	**7**	**15,660**	**170**	**13**	**16**
VK3XB	**3.5**	**1,443**	**49**	**7**	**6**
VK4SS	**A**	**7,950**	**55**	**26**	**27**
VK4EL	**21**	**16,297**	**131**	**20**	**23**
VK4SD	**14**	**15,181**	**114**	**19**	**28**
VK5TC	**A**	**87,498**	**364**	**37**	**52**
VK5WC	**14**	**12,324**	**95**	**22**	**30**
VK5KO	1.8	6	1	1	1
VK7SM	**A**	**62,608**	**240**	**38**	**53**

Fiji Islands

VR2DK	**A**	**125,136**	**321**	**63**	**81**

Guam

W1TRB/KG6	**14**	**86,733**	**445**	**28**	**41**

Hawaii

KH6EPW	**14**	**161,667**	**784**	**27**	**44**
KH6FLC	"	4,278	60	15	16

Marshall Is.

KX6DB	14	4,500	110	8	7

New Zealand

ZL2AWJ	**A**	**295,920**	**747**	**52**	**83**
ZL1AFW	"	67,733	283	35	52
ZL1QW	14	3,136	49	15	13

Philippine Is.

DU1PAR	..	**A**	**130,176**	**414**	**44**	**69**

Wake Island

KW6EI	....	**14**	**7,800**	**113**	**11**	**13**

South America

Argentina

LU7AU	....	**A**	**58,032**	**233**	**44**	**49**
LU8BAJ	....	"	30,805	176	27	34
LU8DQ	....	**14**	**61,050**	**319**	**24**	**42**
LU5ABL		"	12,614	110	22	31

Bolivia

CP5EZ	.....	**A**	**339,295**	**609**	**70**	**129**

Brazil

PY4OD	....	**A**	**796,740**	**1,120**	**79**	**166**
PY2SO	.....	"	208,896	528	47	89
PY7AKQ	..	"	135,520	440	41	71
PY2BZD	..	"	30,552	171	28	39
PY1BLG	..	"	21,648	123	33	33
PY5EG	....	**21**	**16,254**	**138**	**15**	**27**
PY1MCC	..	**14**	**186,499**	**585**	**32**	**77**
PY2BGL	..	"	71,466	290	29	57
PY5OE	....	"	21,022	172	18	28
PY7ALA	..	"	540	15	6	9
PY4AP	....	**7**	**81,673**	**421**	**22**	**45**

Chile

CE2DI	.....	**7**	**9,728**	**108**	**14**	**18**
CE2CR	....	"	2,261	46	9	9

Colombia

HK3AVK	..	**A**	**32,830**	**131**	**39**	**59**
HK3RQ	....	"	27,904	284	23	23

Falkland Is.

VP8HJ	.....	**A**	**146,458**	**607**	**33**	**53**

Paraguay

ZP9AY	.....	**A**	**44,184**	**271**	**29**	**27**

Peru

OA4PF	.....	**A**	**186,645**	**569**	**49**	**66**
OA4EM	..	14	1,972	41	9	8

Suriname

PZ1BH	.....	**A**	**3,768**	**55**	**14**	**10**

Uruguay

CX1OP	....	**A**	**52,998**	**245**	**34**	**39**
CX2CO	....	**14**	**435,732**	**1,129**	**35**	**97**

Venezuela

YV1DP	.....	**A**	**189,600**	**791**	**32**	**48**
YV5BTK	....	**7**	**31,458**	**252**	**12**	**30**

MULTI-OPERATOR
Single Transmitter
North America

United States

K2HLB	.....	**509,343**	**582**	**87**	**216**
		(W2AGW, JT, DEC, DNG)			
W2PCJ	.....	453,299	501	97	222
		(W2PCJ & WB2CKS)			
WB2APG	.....	340,018	499	87	211
		(WB2APG & W3DQG)			
WB2CTK	.....	25,542	113	31	55
		(WB2CTK & WB2BJO)			
W3WJD	.....	**527,796**	**588**	**90**	**234**
		(W3WJD & K3JJG)			
W3KFQ	.....	267,267	397	75	156
		(W3KFQ & K3JGJ)			
K3JCT	.....	167,986	329	59	123
		(K3JCT & K3LJZ)			
W3MWC	.....	149,600	287	62	125
		(W3MWC & K3JLI)			
W3IYE	.....	127,834	276	56	105
		(W3IYE & W3HHA)			
W3WPG	.....	116,501	229	62	125
		(W3WPG & W3SQX)			
K4LIQ	.....	**557,957**	**509**	**114**	**277**
		(K4LIQ & K4SXT)			
WA4DQM	.....	139,995	245	67	116
		(WA4DQM, W4ZYS, ZYQ)			
W4JD	.....	86,584	241	46	91
		(W4JD & WA4HHW)			
W4HOS	.....	44,896	136	48	74
		(W4HOS & W4FRO)			
WA4NST	.....	25,075	109	26	59
		(WA4NST & WA4KAI)			
K411F	.....	21,565	84	35	60
		(K4IIF & K4GRD)			
WA6SBO	.....	**589,937**	**673**	**107**	**210**
		(WA6SBO, LBP, KH6EVT, K6SDR, BHM, W6HAW)			
W7VGQ	.....	**572,736**	**704**	**106**	**198**
		(W7VGQ, WVE, YGN, K7JZP, PBO)			
K7ADL	.....	82,786	583	56	86
		(K7ADL & K7OPB)			
W8SH	.....	**279,624**	**422**	**80**	**164**
		(K8MFO,K8MPF,K8VQP)			
W8HDB	.....	67,116	230	28	74
		(W8HDB, K8DBW, K8WWU)			

Alaska

KL7CGE	.....	**27,720**	**322**	**21**	**19**
		(K8JCB & K9KYE)			

Canada

K1LNV/VE8	..	**5,168**	**151**	**10**	**7**
		(K1LNV/VEB & W3AKD/VE8)			

Greenland

KG1AQ	.....	**5,115**	**78**	**12**	**9**
		(KG1AO, KL7EPW, KL7JDO)			

Africa

Liberia

EL2AD	.....	**738,525**	**1166**	**66**	**149**
		(EL2AD, EL2AE, EL2AM)			

Asia

Cyprus

ZC4TJ	.....	**16,112**	**120**	**19**	**34**
		(Tom & Bill)			

Israel

4X4JN	.....	**362,520**	**674**	**55**	**135**

Japan

JA7YAI	.....	**9,200**	**101**	**20**	**20**
		(JA1GGA & JA7SW)			

U.S.S.R.
Asiatic

UA9DN	.....	**1,014,102**	**1149**	**77**	**241**
		(Vlad, Leo, Nic.)			

(Club Stations)

UA9KQA	.....	332,208	560	60	156
UA9KAG	.....	180,880	462	40	100
UA9KTE	.....	58,638	231	21	66
UA9KHA	.....	27,965	205	10	37
UA9KSC	.....	21,204	125	18	44
UAØKFG	.....	**255,816**	**773**	**55**	**81**
		(UAØEH, UWØFK, UWØFM)			
UAØKKB	.....	106,821	472	38	61
UAØKSB	.....	75,780	410	27	63
UAØKAD	.....	60,265	340	25	60
UAØKCA	.....	31,130	317	23	32
UAØKYA	.....	26,832	230	16	36

Azerbaijan

UD6KAR	.....	**36,516**	**216**	**19**	**49**
		(UD6BQ, UD6CC, Vlad)			
UD6KAB	.....	12,455	90	18	35
UD6KGF	.....	1,768	40	6	11

Georgia

UF6KAF	.....	**20,350**	**128**	**14**	**41**

Kazakh

UL7KDT	.....	**105,512**	**340**	**31**	**79**

Kirghiz

UM8KAA	.....	**340,704**	**796**	**49**	**120**

Europe

Austria

OE3TL	.....	**408,977**	**834**	**76**	**165**
		(OE3TL, OE3LI, OE1-1428)			

Bulgaria
(Club Stations)

LZ1KSV	.....	**318,897**	**653**	**86**	**190**
LZ1KPG	.....	**251,165**	**803**	**56**	**135**
LZ1KNB	.....	142,324	569	47	114
LZIKSZ	.....	53,519	398	31	78
LZIKAA	.....	45,656	321	27	77
LZIKDZ	.....	29,382	303	20	63
LZ1KPW	.....	28,784	177	33	79
LZ2KRO	.....	27,760	310	20	60
LZ2KST	.....	20,562	246	17	52
LZ2KGO	.....	16,368	234	16	46
LZ2KKZ	.....	7,056	118	14	35
LZ1KSW	.....	1,944	62	6	21
LZ1KID	.....	1,408	58	**6**	**16**

Czechoslovakia
(Club Stations)

OK3KAG	.....	**218,964**	**665**	**55**	**158**
OK2KOS	.....	**183,549**	**634**	**48**	**135**
OK2KJU	.....	72,352	268	50	106
OK3KNO	.....	57,147	318	35	94
OK1KTL	.....	34,018	207	25	48
OK1KKP	.....	20,088	241	18	54
OK2KGP	.....	18,232	122	29	57
OK1KKJ	.....	16,499	240	10	39
OK2KMB	.....	15,906	159	21	45
OK2KFP	.....	11,150	110	19	31
OK1KPR	.....	3,374	90	10	29
OK2KOO	.....	2,596	50	17	27
OK1KIT	.....	1,178	36	10	21
OK2KSX	.....	868	29	9	19
OK1KCF	.....	391	26	4	13

Denmark

OZ7OMR	.....	**18,528**	**230**	**18**	**30**
		(Club Station)			

England

G3SBI	.....	**74,462**	**359**	**35**	**82**
		(G3SBI, G3RIK, Alan)			

Finland

OH3AH	.....	**165,236**	**479**	**56**	**146**
		(OH2BAI, BAM, BBF, BBR)			
OH5UX	.....	150,724	432	50	146
		(OH5UX & OH5UY)			
OH3NE	.....	10,659	160	16	41
		(Club Station)			
OH6AB	.....	1,425	44	8	17
		(OH6SU & OH6RD)			

Germany

DL9JL	.....	**192,618**	**631**	**56**	**118**
		(DL9JL, DJ2VS,4XS, 5PA, 5QG, (5ZN, 7DJ, 8EQ, 8GB)			
DL8CM	.....	189,108,	502	65	141
		(DL8CM & DL8CH)			
DJ7SW	.....	177,045	550	62	123
		(DJ7SW, DJ5AZ, DJ6TL)			
DL9VZ	.....	149,150	393	66	124
		(DL9VZ, DJ2VO, 2SK, 6US, 6YT, 9UC)			
DL9VN	.....	115,440	496	36	98
		(4 Operators)			
DL1TA	.....	110,044	449	55	109
		(DL1TA & DJ7JC)			
DLØFT	.....	90,150	348	49	101
		(DL1GW, 1HA, 1HH, 3MN, 6GL, DJ2YV, 5HL, 6NS)			
DJ4SO	.....	86,832	394	43	91
		(DJ4SO, 4FZ, 6TK, 6UK)			
DL9RP	.....	31,600	134	30	49
		(DL9RP & DJ3YU)			
DL5BR	.....	**41,866**	**235**	**33**	**88**
		(DL3BA, 4YO, 5ES, 5JJ, DJ9CN)			
DM3SF	.....	**18,802**	**187**	**23**	**56**
		(DM2AMF, 3JSF, 3NSF)			
DM3EN	.....	15,840	194	17	55
		(DM2BLZ, BWN, 3PCH, MJI)			
DM4KL	.....	10,400	137	20	45
		(3 Operators)			

Hungary
(Club Stations)

HA5KBB	.....	**374,241**	**853**	**72**	**179**
HA6KVB	.....	371,964	1122	62	161
HA1KSA	.....	288,045	801	64	121
HA5KFZ	.....	34,272	239	32	80

Luxembourg

DLØMZ/LX	..	**157,458**	**618**	**51**	**112**
		(DJ4PX, 4SB, 7XN 9GU, 9SB, DL9QY)			

Netherlands

PI1PT	.....	**32,300**	**259**	**23**	**62**
		(Club Station)			

Norway

LA1K	.....	**68,052**	**476**	**25**	**82**
		(LA1EE, 1RI, 1UI, 3EG, 5UF, 6LH)			
LA8D	.....	30,257	250	27	52
		(LA3FG, 7OI, 7Q1)			
LA1JD	.....	21,960	240	20	52
		(LA1MF, 4RI, 9OI)			

Poland

SP8KAR	.....	**129,630**	**465**	**56**	**118**
		(SP8AJK, AJJ, 029, 600I)			
SP9PT	.....	24,357	178	23	46

Roumania

YO3RF	.....	**129,528**	**583**	**49**	**119**
		(YO3RF & YO2FU)			

(Club Stations)

YO3KSD	.....	83,085	419	41	104
YO2KAB	.....	40,252	347	35	81
YO5KAU	.....	31,428	203	25	56

Sweden

SM6AOE	.....	**311,308**	**664**	**67**	**156**
		(SM6AOE, BJI, CKV, CSC, VR)			
SL3AG	.....	108,569	429	39	112
		(SM3PZ & SM3BYO)			
SM5CDC	.....	20,006	160	28	55
		(SM5CDC, AJK, BII, BYX)			

Yugoslavia
(Club Stations)

YU1BCD	.....	**128,076**	**527**	**43**	**113**
YU1DVW	.....	41,490	225	23	67
YU3DBJ	.....	9,453	126	22	47

U.S.S.R.
(Club Stations)
Estonia

UR2KAA	.....	**160,512**	**589**	**49**	**127**
UR2KAC	.....	103,448	613	32	102
UR2KAE	.....	5,150	92	13	37

[Continued on page 92]

Announcing the

CQ Twelve Hour VHF Contest

Saturday, August 7

Who: All amateurs with v.h.f. equipment, worldwide.
What: The new *CQ* Twelve-Hour VHF Contest!
Where: On any single amateur band, six meters on up. This is a single-band-only contest, so you'll only be competing against other stations on the same band. No multiple-band entries accepted. If you like, however, you may enter *separately* in both the six and two meter categories.
When: Contest starts at 9 A.M. local time on Saturday, August 7, 1965, and ends at 9 P.M. local time that same evening (12 hours). Local time is defined as whatever time is being used now in your area, *e.g.*, EDST, CST, PST, *etc.*

Why Twelve Hours?

Because it's fun. Remember the experimental 12-Hour VHF Contest that ran in March '63? Most *CQ* "experts" took a dim view of that impending competition saying that no true-blue contest addict in his right mind would bother to participate in a one day affair. The results, though, amazed us all: More v.h.f.'ers turned out for the short-format contest than had *ever* showed up for *any CQ* v.h.f. contest—then or since!

People who had never really bothered much with their dusty Gonsets or Black Widows (our age is showing) wrote in to say they had the time of their lives.

As a matter of fact the nation's highest scoring participant, WA2SAZ, had never entered a contest before. Yet he racked up 219 contacts in 46 counties to walk away with the high honors trophy plus certificates galore!

Time-worn contesters can pass this one up if they dare. From now on the first Saturday in August will mark the date of the *CQ* Twelve-Hour VHF Contest, designed for the average ham.

Contest Rules

A. CLASSIFICATIONS: 1. 50 mc only; 2. 144 mc only; 3. 220 mc only; 4. 432 mc only

B. OPERATORS:
   1. Any number of operators may work together under one call. Be sure they all sign the log.

C. INFORMATION EXCHANGE:
   1. Your county and state.
   2. His signal report at your station.
   3. Your contact number to him (numbers starting from 1).
   4. Your handle.
   5. Typical on-the-air exchange: "Roger OM. You're 59 Union County, New Jersey. You're my number 017. Handle is Bob. Over."

D. CONTACT POINTS:
   1. All completed contacts with the required information count one point.
   2. Mobile stations may be worked only once during the contest.
   3. Aero-mobile and maritime-mobile contacts do not qualify.

E. COUNTIES:
   1. In the United States only counties will qualify as sections.
   2. In other countries the equivalent political sub-divisions will qualify.

F. HOURS MULTIPLIER:
   1. One different contact during each hour of the contest constitutes a "contest hour." Example: 10 hours equal 10 (power multiplier). Simple?
   2. These must be NEW contacts—not repeats.

G. POWER MULTIPLIERS:
   1. 25 watts input or under (a.m., c.w.), multiplier of 3.
   2. 125 watts input or under (a.m., c.w.), multiplier of 2.
   3. 1000 watts input or under (a.m., c.w.), multiplier of 1.

NOTE: Power levels should remain constant throughout the contest period.

H. SCORING:
   1. Each completed contact counts 1 point.
   2. Each county worked scores 1 point (toward county multiplier.)
   3. Each hour scores 1 point (toward hours multiplier).
   4. Your power multiplier, as explained in paragraph G above.
   5. Computation: Add up all your contacts, then add up all your counties; count up all the hours and write down your power multiplier. If you're running 20 watts, on the air 10 hours, and work 100 stations in 20 counties, you'll score thusly:
   $3 \times 10 \times 100 \times 20 = 60{,}000$ total score.
   Contacts times counties times hours times power multiplier. Now what could possibly be simpler?

I. LOGS:
   1. Logs should be complete in every detail and should contain your total claimed score. Sheets should include (for a typical contact) your time in, your number, his number, his call letters, his handle, and his signal report (as heard at your end).
   NOTE: This differs slightly from the verbal on-the-air exchange. Be sure to get all the required information.
   2. A cover sheet should accompany all entries including band operated (6 meters, 2 meters, etc.), your name and address, names of other operators, and final claimed score. A letter and photograph would be doubly appreciated.
   3. Logs are available free from us. Just send a self-addressed-stamped-envelope for your supply to: *CQ*, The Radio Amateur's Journal, 14 Vanderventer Avenue, Port Washington, New York 11050.
   4. FINAL DEADLINE: Monday, Sept. 20, 1965. Tuesday we start compiling results.
   5. Send all logs and photographs to:
   CQ The Radio Amateur's Journal
   Att: VHF Contest Committee
   14 Vanderventer Avenue
   Port Washington, New York 11050.

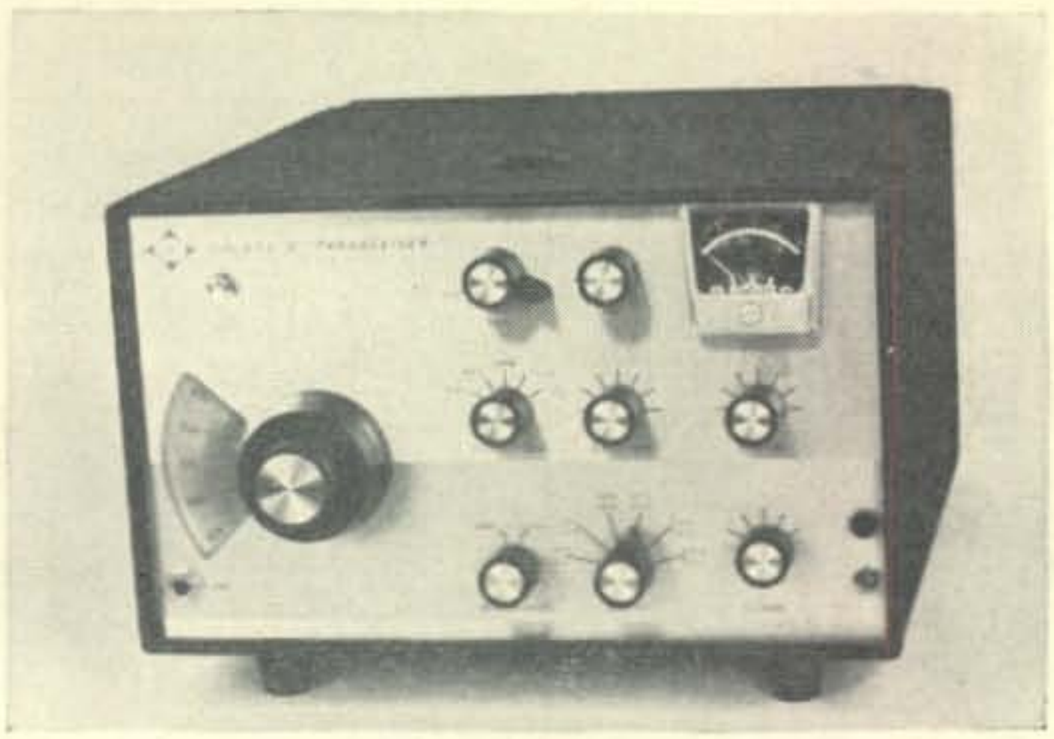
W1RUD with jeep and trailer loaded for action is seen transporting portable 128 element 2 meter array for W1MHL/1 Pack Monadnock expedition.

It Happened Fast

This twelve-hour contest business to this day brings us letters. "When is the next one?" Just prior to closing this month's issue of *CQ*, K2MGA and K2ZSQ got together and decided it was high time we did something about this annoying correspondence.

Please note the power multipliers. These figures have been arrived at through much deliberation and reflect, in our opinion, the low, medium, and high-power levels currently found on the bands above 50 mc. This one-two-three approach should put everyone pretty much on an equal basis. No slant is made toward the high power boys, nor do the flea-power transceivers receive special dispensation. Everyone should have an equal chance to win. *Now let's get in there and pitch!*

All *CQ* staffers who desire to keep their jobs will be on hand for this one—K2EEK included!



The Galaxy V is mounted in a black perforated case. The panel has a brushed-aluminum finish with a light gray lower section. The dual-ratio tuning knob and the dial window are at the left. The two little round objects at the extreme right are the upper and lower sideband indicator lamps.

CQ Reviews:

The Galaxy V Transceiver

BY WILFRED M. SCHERER,* W2AEF

THE Galaxy V is an s.s.b./c.w. transceiver designed for fixed-station or mobile use with full coverage available on the five amateur bands between 3.5 and 30 mc. Filter-type s.s.b. generation is employed and either upper or lower sideband may be selected on any band. For c.w. the transmitter frequency is offset by approximately 1 kc from that of the receiver to enable a beat note to be heard on the received signal while the transmitter is actually tuned to near zero beat with the signal.

The transmitter input power is 300 watts for s.s.b. (p.e.p.) and for c.w. carrier. Grid-block keying is used on c.w., and push-to-talk operation, with a.l.c., is provided for s.s.b. An optional accessory plug-in unit is available for v.o.x. operation.

Frequency is controlled by a stable single-range v.f.o. that is calibrated in 5 kc increments over a 500 kc spread for each band (four band segments are used to cover the 10-meter band). Two dial-drive ratios provide slow vernier tuning (one turn per 15 kc) on individual signals, or fast tuning (one turn per 100 kc) to enable you to quickly go from one portion of a band to another. An electronic calibration-adjust allows you to zero-set the v.f.o. calibration against a 100 kc crystal calibrator, available as an optional plug-in accessory.

The unit is designed for use with an external power supply of which there are two available, one for 117 v.a.c. and one for 12 v.d.c. The loud speaker is used externally too.

Circuitry

A self-explanatory block diagram for the Galaxy V is shown at fig. 1. Although the r.f. lineup is quite conventional, there are a number of other features of interest.

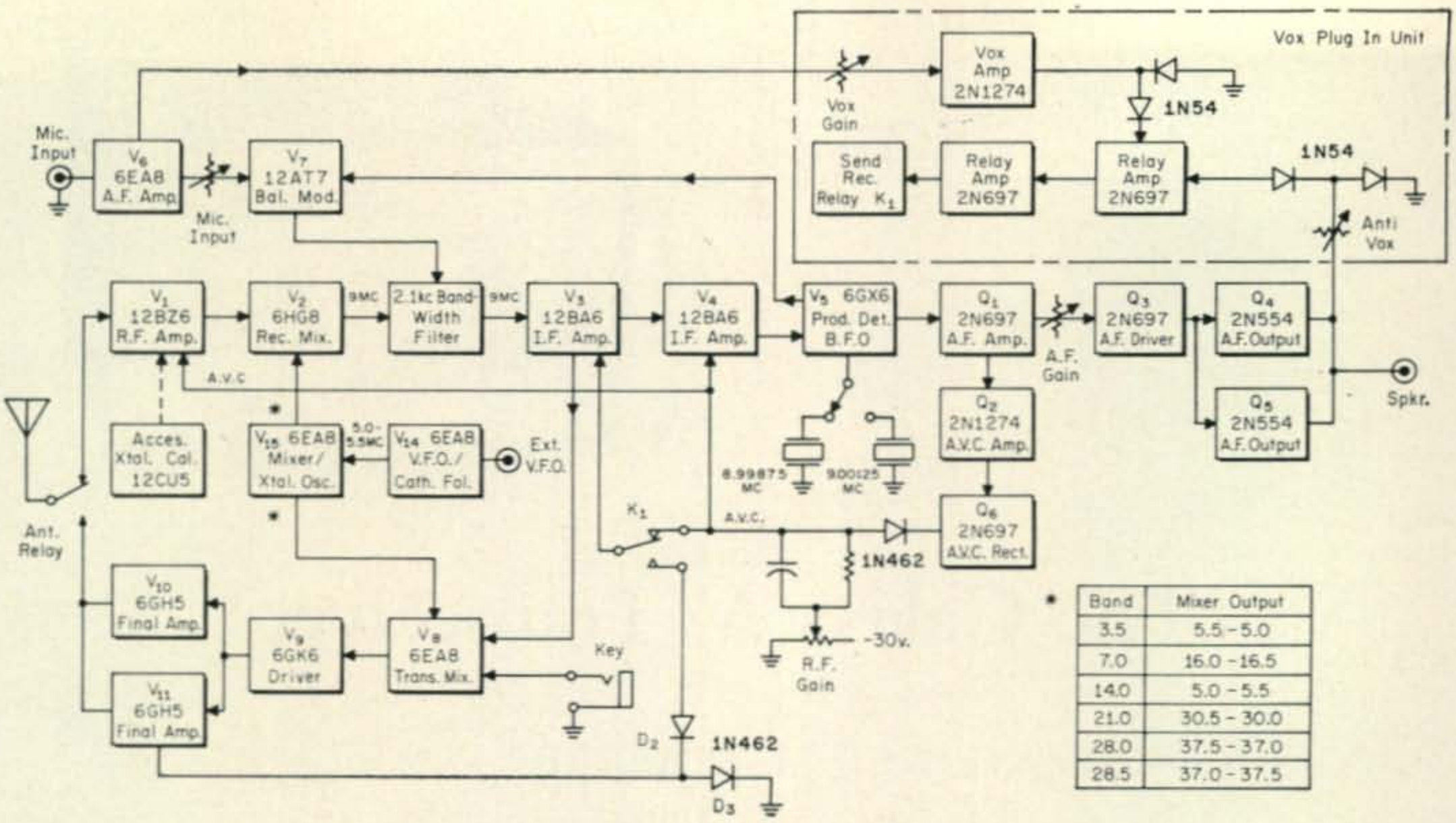
The crystal filter is a 9 mc six-crystal affair having a bandwidth of 2.1 kc. For 80 and 20 meter work the 5.0-5.5 mc v.f.o. output is mixed directly with the 9 mc carrier frequencies. On the other bands the v.f.o. output is mixed in V_{15} with crystal-controlled frequencies to provide heterodyning frequencies needed to beat with the 9 mc signal for operation in the desired bands. The dial tunes in the same direction on all the bands except on 20 meters where it runs in the opposite direction.

Sidebands are changed by switching the 9 mc carrier crystals and by shifting the v.f.o. frequency with a diode switch to cut a padding capacitor in or out. For c.w. operation a fixed capacitor is switched in to "rubber" one of the 9 mc crystals by about 1 kc into the filter pass-band, thus providing a c.w. carrier and the 1 kc transceive offset for copying "on-frequency" c.w. signals.

Heat, space and power are saved by using transistors in the receiver audio system and for the a.g.c. which is obtained by rectifying the a.f. signal and applying the resulting d.c. bias to the a.g.c.-controlled stages. The a.g.c. is designed for a fast attack with fast release on signal variations of 20 db or less, and for a slow attack with a slow release during greater signal-level changes. The first 9 mc i.f.-stage grid is switched by relay K_1 to the a.g.c. bus on receive, and on transmit to the a.l.c. line from which the d.c. bias for the a.l.c. is obtained from D_2 and D_3. A.l.c. functions when the final amplifier commences to draw grid current. The optional v.o.x. plug-in unit also is a solid-state affair using transistors and crystal diodes.

Besides being applied to the v.f.o. and the heterodyning oscillator, regulated B-plus, from an OA2, is used on the balanced modulator to ensure a stable carrier null. A second OA2 regulates the screen voltage on the final amplifier tubes and thus contributes to good linearity. The panel meter automatically doubles as an S-meter on receive and as a plate meter on transmit.

*Technical Director, *CQ*.



*

Band	Mixer Output
3.5	5.5 - 5.0
7.0	16.0 - 16.5
14.0	5.0 - 5.5
21.0	30.5 - 30.0
28.0	37.5 - 37.0
28.5	37.0 - 37.5

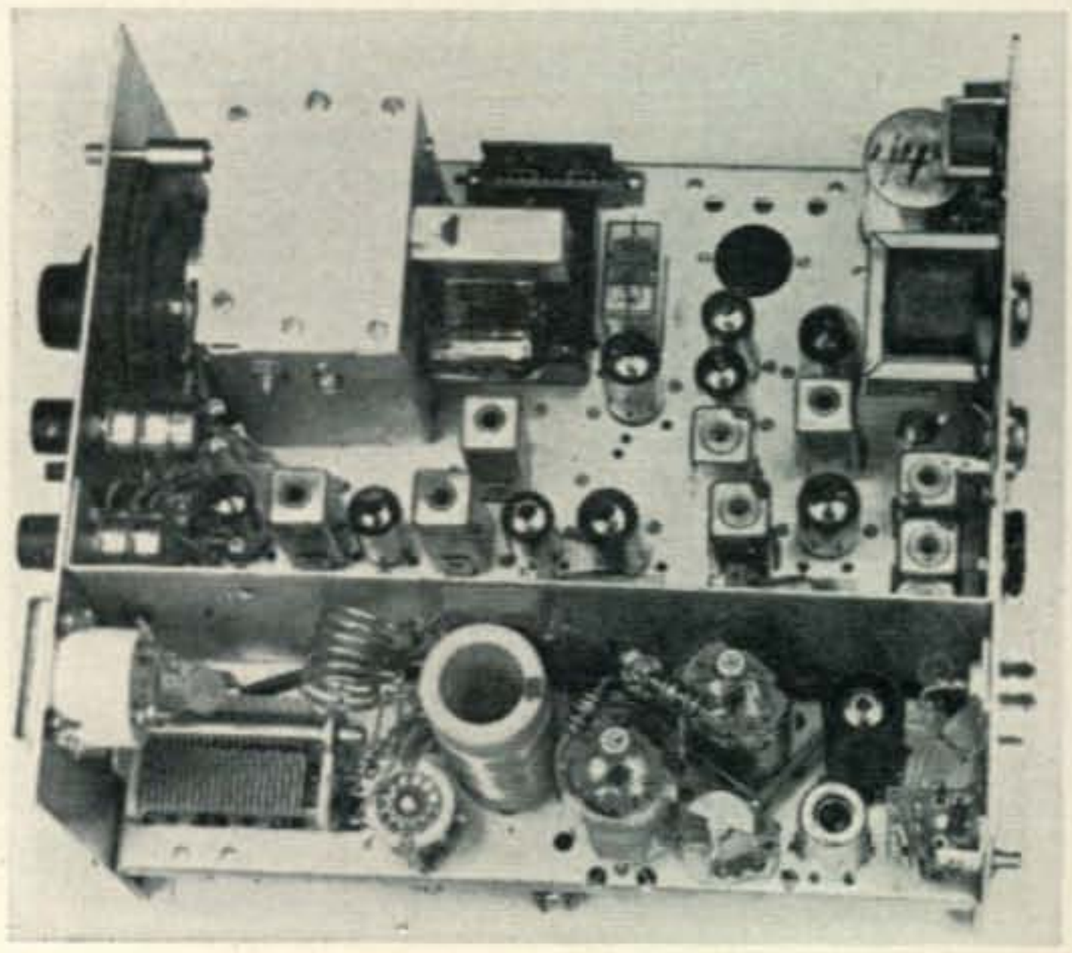
Fig. 1—Block diagram of the Galaxy V transceiver.

Performance

The v.f.o. stability is rated at less than 100 c.p.s. drift in any 15 minute period after warmup, and less than 100 c.p.s. change for a 10% shift in line voltage. We found that starting cold from an ambient temperature of 75° F the drift during the first 15 minutes was 200 c.p.s. After this it went another 320 c.p.s. during a two-hour period, or less than 50 c.p.s. per 15 minute period, thus bettering the specifications. With the a.c. power-line potential centered at 115 volts, a 10% drop in voltage shifted the overall frequency 50 c.p.s., while a 10% increase altered it 125 c.p.s. The v.f.o. is mechanically rugged and the "drop test' showed no evidence of frequency instability or microphonics—an important consideration for mobile applications.

The 5 kc incremental calibrations on the dial are spaced about ⅛" apart and according to the manual can be interpolated to nearly 1 kc. This was found to be mostly on the "nearly" side which, together with a slight parallax at the fiducial hairline, makes it advisable to check the frequency against a crystal calibrator when you're working the band edges.

As may be seen from the photograph, the dial window is at the left of the circular dial rather than immediately above the center of the dial as is the usual custom. For mobile work this makes it easier to view the dial from the driver's seat. On the other hand, it is out of view for operation by anyone but the driver, and if you're a left-handed operator, the arrangement might be awkward during fixed-station use. Since "backward" tuning is used on the 20-meter band, there are two rows of calibrating numerals on the dial which progress in opposite directions. The ones to use for a given band are quickly identified, as not only are they color-coded in red and blue, but the lighting behind the dial shines through both the numerals and the calibrating marks. In addition, the dial window is large, making it possible to view a good portion of the dial range at one time. Another feature is



Inside view of the Galaxy V. The v.f.o. is the box at the upper left. The final amplifier is in the foreground. Its output tank is the vertical heavy-walled ceramic coil with the air-wound 10-meter coil next to it. The a.f.-output power transistors are mounted on the rear apron panel at the right. The empty socket near the upper right is for the accessory plug-in crystal calibrator. At the top center is a jumper board which when removed, allows a printed-circuit accessory v.o.x. module to be plugged in.

that separate panel lamps tell you which sideband is in use when the sideband selector is operated. The high-ratio slow-speed tuning drive makes it easy to zero-in on s.s.b. signals, while the low-ratio knob is very convenient for quickly moving to various parts of a band.

Transmitter

With the transmitter properly loaded to 300 watts input, the power output measured 180-200 watts, depending on the band, for both c.w. carrier and s.s.b. p.e.p. Two-tone test patterns indicated good linearity at full peak power. Sideband suppression above 1.2 kc was over 50 db and carrier suppression was at least 45 db. The overall a.f. response at the 6 db points was 300-2350 c.p.s. and on-the-air reports indicated clean a.f. quality.

The transmitter keyed cleanly on c.w., but break-in operation is not possible, since you must manually switch back to the receive function between transmissions.

Receiver

The receiver sensitivity is specified as .5 μv for 10 db S/N ratio and was found to be .25 μv or better on all bands. Sideband suppression was over 55 db at 1 kc. Only one in-band tweet was noted (near 21.2 mc) and was equivalent to a 1 μv input signal. I.f. rejection at 9 mc was at least 60 db down, while image rejection was 70 db minimum.

A.g.c. characteristics produced a 6 db change in a.f. output for a 60 db input-signal increment (10 to 10,000 μv) as per specifications. The S-meter read S-9 with input-signal levels of between 60 and 100 μv, depending on the band in use.

After the transmitter has been tuned up for a particular frequency, the receiver input circuits will automatically be tuned at the same time, since these circuits are common to both the transmitter and the receiver. If just the receiver is used when changing frequency, the transmitter EXCITER-TUNE has to be peaked for "preselector" tuning.

The a.f. power output amplifier is designed to feed a 3-8 ohm speaker for which there is plenty of power (3 watts) to produce clean and crisp audio quality. There is no phone jack, so if you want headphone listening, you have to unplug the speaker from its phono jack on the rear panel and insert the headphones using a phono plug.

With c.w. operation the direction of the 1 kc offset changes on the different bands. On 80 and 20 the transmitter frequency will be lower than that of the received signal and on the other bands it will be higher. This must be taken into consideration when you're operating near the edge of a band. The sideband panel lamps indicate whether the frequency will be lower or higher.

Although complete 10-meter band coverage is available, only two 500 kc segments may be switched back and forth, since there are only two crystal positions for this band. If operation on one of the other segments is desired, the unit must be removed from the cabinet and a crystal changed accordingly.

Construction

The Galaxy V is compactly arranged in a cabinet that takes up less than one cubic foot of of space and the unit is solidly built to stand rough treatment. Good ventilation is afforded by perforations in the cabinet and a hinged cover makes accessibility convenient.

The a.f. power-output transistors are mounted on the rear panel which serves as a heat sink for them. Also on the rear are a bias-adjust, a ground terminal, the main-power plug, a power plug for an external v.f.o., and phono jacks for external p.t.t. switch, phone patch, auxiliary relay contacts for operating external gear and 12 v.a.c. The latter is for illuminating the meter on an accessory deluxe console. An SO-239 type coax connector is used for the antenna and a standard two-circuit jack for the c.w. key.

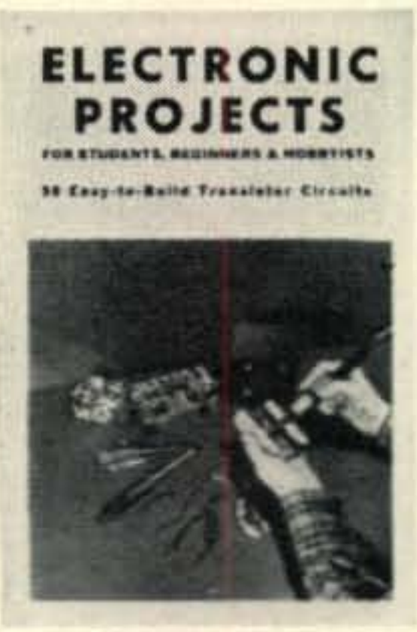
Power requirements are: 800 v.d.c. @ 400 ma with 10% regulation for 80-400 ma swing; 300 v.d.c. @ 200 ma with 10% regulation; Negative 100 v.d.c. @ 35 ma; 12.6 v.a.c./d.c. @ 5 a.; 12.6 v.d.c. @ 1a.

The Galaxy V is priced at $469.95 (10-meter crystals supplied with the unit are for 28.0-28.5 and 28.5-29 mc). The Power supply, Model A.C. 35, for use with 115 v.a.c. is priced at $79.95, and the 12 v.d.c. power supply is $119.95. These units are products of World Radio Laboratories, 3415 West Broadway, Council Bluffs, Iowa 51504.

New Amateur Product

Semitron Transistor Handbook

Electronic Projects For Students, Beginners, & Hobbyists, published by Semitronics Corporation, 265 Canal Street, New York, N.Y. 10013, contains 50 easy-to-build transistor circuit projects anyone can make with readily available inexpensive parts and simple tools (soldering iron, pliers, screwdriver). Parts are available from Semitronics or your local electronics dealer. The price of the handbook is $1.95. For more information either write direct or circle 65 on page 110.



DX

BY URB LE JEUNE,* W2DEC

THE 11th Pacific Northwest DX Convention sponsored by the Willamette Valley DX Club, Inc. to be held in Portland, Oregon on the 14th and 15th of August, 1965. Address inquiries and correspondence to the registration chairman: Dick Crane, W7AC, SE Brooklyn St., Portland, Oregon 97206.

Here and There

CEØA Easter Island: The last of the CEØAG cards have been sent out and at this time everyone sending CEØAG a card has received one in return. If you sent a card but did not receive one check with the bureau first and then if no success, send SASE and another card to CEØAG for direct response.

CN8 Morocco: The Marocan Customs Association has now a Radio Amateur Division affiliated to the Royal Radio Amateur Association of Morocco. The aims of that division is to help Marocan beginners to acquire technical knowledge and to promote them to active radio amateurs. The staff includes CN8BV technical assistant; CN8EM President of the Marocan Customs Association; CN8AL, v.h.f.; and CN8CU, CN8AX, CN2BS, CN8AZ, CN8MA, CN8CZ—contributing members. That new section needs technical help and will be glad to receive old manuals and magazines. Things may be sent to the Association Douaniere Marocaine, B. P. 50 73 Boulevard d'Anfa, Casablanca, Morocco.

Cape Verde Island: George, CR4AJ, remains active. Often heard about 1800 GMT any place in 20 meter band. *(Tnx LIDXA).*

EA6 Balearic Islands: EA6 operation by WA2QNW, Win Tames, is slated to start on 15 June for about 15 days. Win is now in contact with EA6AM with regard to possbile EA9 stint in addition to the EA6. Further word later. *(Tnx LIDXA).*

FL8 French Somaliland: FL8RA on 14060 kc at 2200 GMT *(Tnx LIDXA).*

HR Honduras: Jim, HR3JP/W5NSE, passes along the following. "I am crystal controlled in Honduras with a DX-20 running about 30 watts to a dipole. During the recent ARRL DX Test, I made about 600 contacts with W/K stations. I have only operated c.w. in Honduras, but I intend to take a HW-32 down with me on the next trip. I spend a week or two in La Ceiba every couple of months. I will leave the Heathkit sideband transceiver there in Honduras and HR3EB will use it while I am in the States. I will serve as his QSL Manager. Incidently, HR3EB, Woody, had not QSLed many contacts of 1962 and earlier and the maid threw out all his QSLs received from s.s.b. and a.m. contacts. He could only find about 12 which he QSLed. So you might mention that all QSLs will be answered even without s.a.s.e. thru the appropriate bureaus or direct if another card is sent to W5NSE. I am the current president of the QRP A.R.C. International. Our membership is now over 2100 members from 63 different countries and all 50 states. It is for low power operators, 100 watts or less. Any information concerning joining can be obtained from K8DZR or me at 5608 St. Bernard Ave., New Orleans, La. 70122."

KS6 American Samoa: KS6BQ, Ed around 14310 kc from 0500 GMT, five days a week for about one year. QSL Box 26, Pago Pago, American Samoa. *(Tnx WGDXC).*

MP4T Trucial Oman: Roger, MP4TBO, is now QRV on 7, 14, 21 mc using a KW 2000 which runs 75 watts on c.w. and 90 watts on s.s.b. He will have a beam at the end of July. *(Tnx VE1AKZ).*

OHØ Aland Island: A DX trip to the Aland Islands will be made by OH2AM in July. Dates are the 18th to the 27th of July, 1965. Operation on frequencies of s.s.B.: 3790, 7070, 14125, 14240 and 21350; c.w.: 3505, 7005, 14040, 21040. 24 hour operation. Equipment is FL 100B plus p.a., FR 100B receiver, TH3 three element beam 10/15/20, inverted Vee 40/80. QSL via W2CTN. Operators will be Martin, OH2BH; Art, OH2BQ; Mark, OH2BS; Rick, OH2SB.

ST2 Sudan: K4DAD/5 reports via the LIDXA ST2NL on almost daily and weekends about 1730 GMT on 21050.

TJ Cameroun: TJ1AC, Fred, active 14238 kc s.s.b. 1900 GMT. QSL via 5N2 Bureau or c/o W. Cameroun Electricity Corp., Victoria, Rep. Cameroun. *(Tnx VERON).*

VK4 Willis Island: VK4TE still active. Try 40 meter c.w. as well as 14063. Mostly weekends. QSL to VK2AGH. *(Tnx LIDXA).*

Terr. of New Guinea: VK9TG, Ted, active recently about 12-1300 GMT on 14250-300 saying he is on an island 80 miles from Papua but says he counts as Terr. of New Guinea. However, they are looking to ARRL for new country

The ever popular UA2AO. Andy built the entire station himself. *(Tnx Jimmy Hart).*

*Box 35, Hazlet, New Jersey 07730.

The following certificates were issued between the period from April 6th, 1965 to and including May 5th, 1965:

CW-PHONE WAZ

2129	WB2FSW	Stuart P. Domber
2130	WA2HUV	Richard C. Bourne
2131	OK3IR	Svitel Milan
2132	VE8DX	Don MacLean
2133	SP8SZ	Wladyslaw Socha
2134	W8LUZ	D. R. Hearsum
2135	DM2AND	Heinz Boehnke
2136	SP5AFL	Leon Kossobudski
2137	K9WTS	Gunnar F. Ohlson
2138	K4RDE	Leroy V. Fowler
2139	W5MBB	Mary Busick, W5MBB
2140	DJ2SR	Ernst A. W. Munter
2141	K1HVV	Myron E. Knowles
2142	OK3UL	Josef Straka
2143	KL7DTB/6	Iris Colvin
2144	YV5AXQ	J. F. Alicandu
2145	YO3FF	Petre Cesar

ALL-PHONE WAZ

296	WB2FSW	Stuart P. Domber
297	YV5AXQ	J. F. Alicandu

TWO-WAY SSB

315	WB2FSW	Stuart P. Domber
316	KH6FBJ	H. C. Sherrod, Jr.
317	W7QPK	Fred M. Conover
318	YV5AXQ	J. F. Alicandu

CW WPX

636	DJ6BW	Erich Russ
637	UI8LB	Alexey Belyaev
638	UB5ES	Koval Yuri Yosefovisch
639	G3PJW	R. S. Unsworth
640	DL6QW/A	Sig Reinhold
641	DL1VG	Kurt Jana
642	SM5BGK	Gary Lee Wickstrom
643	W9FJX	C. F. Hauri
644	OK1AEV	Pavel Cibulka
645	K8EHD	Stephen P. Hart
646	KR6BQ/KØPIV	Gerald L. Hale
647	OK3UL	Josef Straka

PHONE WPX

117	PAØGMU	W. Mulder

SSB WPX

208	UA3BT	Ewgeniy Danilov
209	DL2DM	Capt. K. L. Miller
210	KA2BW	Wm. L. Weise, Jr.
211	UB5UN	Serge G. Bunimovich

100 TWO-WAY SSB

470	YN1LH	Armando Lanza

status. Possibly this island is governed by someone else. As such, it might fit the requirements. *(Tnx LIDXA).*

VK9 Cocos Keeling: VK9CR was heard active on 14100 and 14250 s.s.b., QSL to VK6RU. *(Tnx VERON).*

VP1 British Guiana: VP3AA, Dave Packard around 14280 kc from zero hours, QSL via U. S. Consulate, Georgetown. This is the only s.s.b. station active at present. *(Tnx WGDXC).*

VP8 South Georgia & Others: According to Eva, PY2PE, via the LIDXA, the s.s.b. equipment for VP8HO should be on the air by 27 June at the latest for about 18 months operation from this area. There will be a week's stint on South Shetlands, a week from South Orkney and a week from the South Sandwich Is. as minimums.

VR2 Fiji Islands: VR2ET Lionel (ex-VK9LA) now active s.s.b. 14115 kc from 0800 GMT. QSL via VK6RU. *(Tnx WGDXC).*

VU2 Andaman Islands: VU2DI has sailed on 14 April from Calcutta and will sign as VU2DIA for three years. He will operate mostly 14 mc c.w. QTH is B. S. Hedge, ATMO, Interstate Police Wireless, Port Blair, Andaman Islands. *(Tnx LIDXA).*

ZD7 St. Helena: ZD7GP will be QRV from here until August (on vacation). Peter's home call is GW3LXI and he requests QSLs to that call which is OK in the *Callbook*. He frequents the high end of 15 meters s.s.b. and also works on 21041 c.w.

ZD7IP, George, ex-ZC4IP, now is active from St. Helena. He is on 21010 c.w. at 1830 GMT. *(Tnx VERON and LIDXA).*

ZL3 Chatham Islands: Ted, ZL2AWJ, reports the following: "Regret to say that the proposed Chatham trip has been cancelled. Had received confirmation of travel to the Islands on May 5 for, unfortunately, only a short stay and telephoned ZL2GX to take up his offer of a KWM-2 to use there only to find that having heard no news from me he had assumed I had given up the idea and was at that moment checking s.w.r.s on an antenna for Ian, ZL1ABZ, to take to Chatham. As Ian was due to arrive by the ship

Clay, KH6FBJ, is the first station to qualify for 2 way s.s.b. WAZ from two different stations. Clay also turned the trick as XW8AS.

You would never know it by looking at the walls, but DL1QT is one of the world's top certificate hunters.

I was to return on, I reluctantly decided that to proceed myself would simply duplicate efforts with no benefit to anyone except gratifying my own desires, so I have withdrawn from the field. Many thanks for your cooperation in spreading the word. I'm currently trying to think of somewhere else in this area rare enough to warrant going. Any ideas?"

5WL Western Samoa: 5W1AZ, George, 14085-95 kc from 0800 GMT most days *(Tnx WGDXC).*

Jack, KC4USP, during a leisure moment. Jack operates s.s.b. on the following frequencies 14,288, 21,410, 7296 and 7,218 kc. *(Tnx WA6WPG).*

Certificates

SP DX CLUB AWARD

The SP DX Club will award an attractive certificate attesting honorary membership to any licensed amateur (other than SP) having two way communication with fifteen (for European operators) or ten (for DX) or more regular SPDXC members. No QSL need be submitted but listed contacts shall have been confirmed by QSL and verified by SPDXC and shall have been made after Oct. 1, 1959. Applicants for this certificate should submit their lists and ten IRCs to SP DX Club (PZK), P. O. Box 424, Lodz 1, Poland. Some SPDXC members are: SP's 1AFM, 2AJO, 2AP, 2BA, 2BE, 2HL, 2LV, 3AK, 3DG, 3HD, 3PK, 3PL, 5ACN, 5ADZ, 5AEF, 5AIB, 5AIM, 5GX, 5HS, 5XM, ex 5YY, 6AAT, 6BZ, 6FZ, 7AZ, 7HX, 8AHH, 8AG, 8AJK, 8CK, 8CP, 8EV, 8HR, 8HT, 8HU, 8JA, 8MJ, 8SR, 8SZ, 9ACK, 9ADU, 9CS, 9DN, 9DT, 9EU, 9FR, 9KJ, 9NH, 9PT, 9QS, 9RF, 9SF, 9TA.

WORKED ALL DM AWARD WADM

In appreciation of the achievements of short wave amateurs working in the spirit of peaceful and friendly cooperation with amateur radio stations in the German Democratic Republic, the Radio Club of the G. D. R. issued the radio amateur certificate WADM.

APPLICANTS: Every short wave amateur in the G.D.R. or other countries may acquire this certificate provided that he is in possession of a valid radio amateur license of his country.

RULES: 1. For this award all confirmed contacts after July 14, 1953 are valid in the bands 3.5 to 28 mc, but c.w. only or fone only. Applications including contacts mixed in c.w. and fone are not valid.

2. The WADM Award is issued in the following classes:

WADM 1 (Champion Class) . . . . . 15 DM districts and 150 points

WADM II (Master Class) . . . . . 15 DM districts and 100 points

WADM III (Senior Class) . . . . . 13 DM districts and 40 points (non-European 28 points)

WADM IV (Junior Class) . . . . . 10 DM districts and 20 points (non-European 14 points)

The certificates are numbered in each class and in each mode.

3. Every DM district counts 1 point per band. Maximum number of points to be obtained: 15 districts × 5 bands = 75 points. Confirmed contacts with the same DM station in 4 or 5 bands count 4 or 5 bonus points, but only once per band and only for WADM I, II, III. Thus a maximum number of additional points of 15 × 5 = 75 points is to be obtained. As to the 4 or 5 band-contacts the intervals are unlimited. Please notice: For 4 or 5 band-contacts the call-signs DM3K . . . or DM3 . . . and DM 3 L . . . or DM4 . . . are the same, i.e. DM3KBB = DM3BB, DM3LCN = DM4CN.

4. Decisive for the points system is the division of the districts of the German Democratic Republic. The last letter of the call sign indicates the district (DM . . . A = Rostock, DM . . . B = Schwerin, etc.) For districts which have not been worked or worked on all bands, stations with a special call (DM7 . . ., DM8 . . ., DM9 . . ., DMO . . .) may be counted irrespective of their place. Every special station worked more than once may be valid only once for one district not reached (per band).

APPLICATIONS: 1. Applicants for the WADM should use the forms issued by the Radio Club of the G.D.R. (see appendix). If these forms are not available, please submit a list giving the call signs of the DM stations, QRG, mode (c.w. or fone), the name and the exact address of the applicant. QSL cards need not be submitted. A confirmation of the form or list by the radio club or by the award manager is sufficient.

2. Applications and all correspondence are to be addressed to the Radio Club Der DDR, DM Award Bureau, Berlin No. 55, Postbox 30, German Democratic Republic. The decision of the DM Award Bureau is final. Fees for WADM III and WADM IV is 4 IRC and for WADM I and II 8 IRC. Foreign applicants whose organizations issue the certificates of their countries in exchange for awards from GDR are awarded the certificates free of charge.

QTH's and QSL Managers

WB6FGT wishes to offer his services as a QSL Manager. His address is Galen F. Tustison, 4446 W. 170th St., Lawndale, Calif. 90260.

AC-H	via Hammarlund, GPO 7388, New York, N.Y.
AP5HQ	via W4LRN.
AP5KC	c/o T. T. C., Karachi, W. Pakistan.
CEØXA	via W4DQS.
CP1EA/5	via W2CTN.
CR4AJ	via W2VCZ
CR4BB	Box 61, Praia, Cape Verde Islands.
CR7CI	Box 2060, Lourenco Marques, Mocambique, Africa.
CR8BH	via Hammarlund, GPO 7388, New York, N.Y.
EL7B	c/o LITM, Harbel P. O., Liberia.
EL8X	via SM5AIO.
ET3DR	via K8KLV.
ET3RN	Box 145, Addis Ababa, Ethiopia.
FG7XL	Box 109, Pointe-a-Pitre, Guadeloupe.
FG7XT/FS7	via K5AWR.
FK8AT	via W2CTN.
FL8RA	Roger Andre, Box 188, Djibouti, French Somaliland, or via R.E.F.
FP8BH	via W1PFA.
FY7YL	Box 267, Cayenne, French Guiana.
HL9TL	via W3WXY.
HR3EB	via W5N SE.
HR3JP	5608 St. Bernard Ave., New Orleans, La. 70122.
HS3RP	201 DET-RB, APO 96237, San Francisco, Calif.
HZ1AT/8Z4/8Z5/8Z5AT	via G8KS.
KG6IF	via K7CAD.
KS6BO	via W4WYX.
KS6BQ	Box 26, Pago-Pago, American Samoa.
KW6EJ	via W2CTN.
KX6DB	via W5TDE.
M1ZG	via DJ1ZG.
MP4TBM	Box 8, Sharjah, Trucial Oman, Persian Gulf.
MP4TBN	P. O. Box 8, Sharjah, Arabian Gulf.
MP4TBO	Box 8, Sharjah, Trucial Oman, Persian Gulf or via VE1AKZ.
OD5BZ	R. R. Adams, O5D/ARPA, Field Unit (ME) APO 694, N.Y., N.Y. or via W8ZCQ.

[Continued on page 104]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

July	3-5	Venezuelan Contest
July	16-18	Colombian Contest
July	24-26	West Virginia QSO Party
August	**7-8**	***CQ* Summer VHF**
August	7-8	Illinois QSO Party
August	14-15	WAEDC C.W.
September	11-12	WAEDC Phone
September	18-19	SAC/C.W.
September	25-26	SAC/Phone
September	25-26	RSGB 21/28 mc Phone
October	2-3	WADM C.W.
October	16-17	RSGB 7 mc DX Phone
October	20-21	YLAP C.W.
October	**23-24**	***CQ* WW DX Phone**
November	3-4	YLAP Phone
November	6-7	RSGB 7 mc DX C.W.
November	**28-29**	***CQ* WW DX C.W.**

Venezuelan Contest

Starts: 1000 GMT Saturday, July 3
Ends: 2400 GMT Monday, July 5

This is a phone only contest, organized by the Radio Club Venezolano to commemorate the 154th anniversary of the independence of Venezuela.

The YV boys practically won all the Trophies in our Phone contest so maybe we can square things by winning a few of their awards.

Full details about this one in last month's CALENDAR.

All entries must be in the hands of the Committee before September 15th and they go to: The Radio Club Venezolano, P.O. Box 2285, Caracas, Venezuela.

Colombian Contest

Starts: 0000 GMT Saturday, July 17
Ends: 2400 GMT Sunday, July 18

A new contest organized to celebrate 100 years of communications in Colombia. Its the world working the HK's on all bands and modes. Full coverage in last month's CALENDAR. Your logs must be in the hands of the Committee before October 20th, address: The L.C.R.A. P.O. Box 584, Bogota, Colombia, S.A.

West Virginia QSO Party

Starts: 0001 GMT Saturday, July 24
Ends: 0500 GMT Monday, July 26

The annual West Virginia QSO Party is being held a month earlier than last year's date. This year's event is being sponsored by the Kanawha Radio Club of Charleston, W. Va.

The party offers an opportunity to gain credits toward the Worked West Virginia Award, the West Virginia Counties Award and the USA-CA program.

Exchange: QSO number, RS/RST report, and ARRL section or country for out of state stations. West Va. stations will send their county.

Scoring: Each completed QSO counts 1 point. Multiply total contact points by number of West Va. counties worked. West Va. stations will use ARRL sections and countries for their multiplier. (However they are not permitted to work stations in their own state for point credit.)

Awards: Certificates to the highest scoring station, both phone and c.w., in West Virginia and tion, both phone and C.W., in West Virginia and each participating ARRL section and each country. (Multi-operator stations are not eligible.)

Frequencies: 3570, 3890, 3903, 7050, 7205, 14050, 14300, 21050, 21410, 28050, 28800 and 50250 kc.

Use all bands as indicated, both phone and c.w., and the same station may be worked twice per band, once on phone and once on c.w. Keep times in GMT and indicate your ARRL section on your log.

Logs go to: Carl R. Nelson, K8BIT, 4620 Kanawha Avenue, S.W., South Charleston, West Virginia 25309.

Illinois QSO Party

Starts: 1600 GMT Saturday, August 7
Ends: 2200 GMT Sunday, August 8

The 3rd annual Illinois QSO Party promises to provide plenty of activity. Cliff Corne, K9EAB and his committee are giving it full publicity and they hope to have over 60 counties on the air. So it will be possible to work the 52 counties needed to earn the first step for the Illinois Counties Certificate. A s.a.s.e. to Cliff will get you a county map of Illinois.

Rules are of the conventional state party type and will be given in details next month.

CQ Summer (12-hour) VHF Contest

Starts: 9 a.m. local time, Saturday August 7
Ends: 9 p.m. local time the same evening

For the exact rules and regulations on the contest see page 61 and the VHF Column. The big thing with this contest is that it is no longer an endurance marathon. Twelve hours gives everybody an equal chance including the newcomer to contest operating. It is also a single band contest either 6, 2, 220, or 432 which makes the competing easier.

[*Continued on page 101*]

*14 Sherwood Road, Stamford, Conn. 06905.

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

THE OSCAR III amateur radio satellite continues to orbit the earth every 103.5 minutes. Scientists now estimate that the satellite may remain in orbit for as long as 1500 years!

Although the satellite's 2 meter communication repeater has been inoperative since March 25, the telemetry beacon is still operating on 145.85 mc.

During the 17 day life of the repeater, more than 150 successful two-way 2 meter QSOs took place through the satellite, between radio amateurs on at least three continents. Amateurs and space-listeners throughout the world are urged to continue to monitor the satellite's telemetry beacon, and to send reception reports to Project OSCAR, Foothill College, Los Altos Hills, California, USA. This information continues to be valuable as a source of tracking data and for determining the temperature within the satellite and the power supply level.

At first believed to be inoperative, Project OSCAR headquarters now reports that OSCAR III's c.w. beacon on 145.95 mc may be operating from time-to-time, but at a very low power level. It is urged that this frequency be monitored very carefully, and if the beacon transmitter is heard, Project OSCAR Headquarters should be notified as soon as possible. It is very important that it be established if this beacon transmitter is operating, and to note the type of emission, keying, and other characteristics of the signal.

K2MWA/2

One of the leading club stations to communicate through the OSCAR III satellite was K2MWA/2, the Crawford Hill, New Jersey VHF Club. As far as is known at the present time, they are the only group that worked all continental USA call areas via the satellite. In achieving this record, they also managed to QSO 15 states. The following is a list of the confirmed two-way QSOs made from K2MWA/2:

W1QXX (Massachusetts), K2GUG (New York), WA2WEB (New Jersey), W3BYF (Penna.) W4HHK (Tennessee), W4MNT (Florida), W4AWS (Florida), K4QIF (N. Carolina), K4MNH (Virginia), K5WXZ (Texas), W5JWL (Arkansas), W6GDO (California), W7JRG (Montana), W8KAY (Ohio), W9TGB (Illinois), K9AAJ (Illinois), WØEYE (Colorado), and VE3BQN (Ontario, Canada).

The gang at K2MWA/2 also *heard* SM7OSC, G6AG, DL3YBA, as well as several dozen other USA and Canadian stations.

The operation of K2MWA/2 was shared by W2FZY, K2IYC, W2IMU, W2CQB, W2LSG, W2WVA, W2IPJ, WB2ETS, WB2ATB and K2MWA.

Equipment used by the group was a 300 watt transmitter for the first few days, which was raised to 1 kw after orbit 75. The final ran a GE 6183 in grounded grid. The converter was a 416B grounded grid front end, with a noise figure of 3 db, and with a tunable 14-18 mc i.f. fed into a Collins 51J-1, a Collins 75S-3, and a RACAL receiver. A fixed tuned panadaptor was used to observe the signals visually. The antenna at K2MWA/2 consisted of 4 six element Yagis arranged for *circular polarization*. The array was steerable in both the vertical and horizontal planes.

Other Satellite Activity

With the excitement of the successful launch of OSCAR III, space has not permitted reporting the many other space achievements which have taken place during the past several months.

The following is a thumb-nail review of the satellites launched since December, 1964, which contain radio transmitters that may be received by space-listeners on earth:

SAN MARCO, an Italian built scientific satellite, was launched on a cooperative basis by the United States on December 12, 1964. The satellite measures certain characteristics of the ionosphere as well as air drag, from which the density of the atmosphere can be deduced. An ionospheric beacon operates on 20.005 mc, and a continuous telemetry transmitter operates on 136.740 mc. A command telemetry transmitter also operates on 136.530 mc.

The 26th in the highly successful EXPLORER scientific satellite series was launched by the United States on December 21, 1964. The satellite is studying natural and artificial radiation belts which surround the earth, and is sending continuous telemetry data on 136.273 mc.

TIROS-9, an American weather satellite, was launched on January 22, 1965. The satellite contains two television cameras for sending cloud formation pictures back to weather forecasters on earth. Cloud cover data is transmitted upon command on 235 mc, and two command operated beacon transmitters are on 136.919 and 136.231 mc. TIROS-9 had taken more than 30,000 useful cloud cover pictures before one of the cameras aboard the satellite failed during early April. The second camera continues to function satisfactorily, and is taking about 250 pictures daily which are being used for improved weather forecasting throughout the world.

ORBITING SOLAR OBSERVATORY-2 was launched by the United States on February 3. Like Oso-1, it is a spinning cylinder, above which is mounted a semi-circular "sail" which keeps one of the sides constantly facing the sun. Oso-2 is measuring radiation from the sun in the ultraviolet, X-ray and gamma-ray regions of the spectrum.

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Telemetry data from the satellite is being sent continuously on 136.712 mc.

PEGASUS-1, launched by the United States on February 16, is a wing-like structure, consisting of three panels, measuring approximately 96 feet by 14 feet. This is the largest spread of any satellite launched to date. The panel surfaces are instrumented to detect collisions with meteors. As they strike the panels, radio signals are flashed to earth over two telemetry transmitters operating on 136.890 and 136.410 mc. The former is continuous, and the latter operates on command only. PEGASUS is supplying valuable information concerning the number of meteors and their sizes, that high altitude manned spacecraft are likely to encounter.

On March 9, along with the launch of the OSCAR III communication satellite, The United States launched four other scientific satellites; GRAVITY GRADIENT-2 which is transmitting continuous telemetry data on 136.742 mc; GRAVITY GRADIENT-3, which is transmitting continuous telemetry data on 136.767 mc; SOLAR RAD, which is transmitting continuous telemetry data on 136.800 mc, and EGRS-3, which is transmitting continuous telemetry data on 136.841 mc.

EGRS-2 was launched by the United States on March 11. The satellite is sending continuous scientific data back to earth via a telemetry channel on 136.838 mc. This was followed by the successful launching of EGRS-4 on April 3, which is sending continuous telemetry data on 136.840 mc.

On March 18, the Soviet Union launched the two-manned spacecraft VOSKHOD-2. On board were Cosmonauts Belyayev and Leonov. During one of the orbits, Cosmonaut Leonov became the first man to leave a spacecraft when he spent about 20 minutes in space. The spacecraft returned safely to earth on March 19. Russian news sources have reported that the telemetry and communication frequencies used by VOSKHOD-2 were 143.625, 17.365, 18.035 and 19.996 mc. There have been several reports from space-listeners who claimed they heard the Russian Cosmonauts communicating from space back to ground on some of these frequencies.

On March 21, the United States successfully launched RANGER-9 to the moon. Before hitting the moon at 1408 GMT on March 24, the satellite sent back to earth a few thousand television pictures of the moon's surface. Relayed by the national television networks, several million persons across North America saw these first live television pictures ever taken of the moon's surface. The success of RANGER-9, the last planned in the RANGER series, makes it three in a row for the program. The purpose of the RANGER program was to get details of the moon's surface and learn of possible landing sites for future lunar spacecraft.

The United States GEMINI GT-3 two-manned spacecraft was launched successfully from Cape Kennedy on March 23. Aboard the spacecraft were Astronauts Grissom and Young, who maneuvered the ship into several different orbits during the flight. The GEMINI GT-3 flight lasted for three orbits around the earth, and was landed under manual control of the two Astronauts. Several space-listeners have reported receiving signals from the GEMINI spacecraft on 15.016 mc.

EXPLORER-27 was launched by NASA on April 29. The primary mission of this scientific satellite is to map the earth's gravitational fields. The secondary objective is to measure certain characteristics of the ionosphere. There are *seven* radio transmitters aboard the EXPLORER-27 satellite. Four unmodulated continuous wave transmitters operate on 20.005, 40.010, 41.01 and 360.00 mc. The signals from these transmitters are being studied by scientists in at least 36 countries in an effort to learn more about the ionosphere and its influence on long-distance h.f. radio transmission. Two transmitters, operating on 162 and 324 mc, provide unmodulated continuous wave signals with which ground observers can make Doppler shift measurements in connection with mapping the earth's gravitational fields. Telemetry data is sent back to earth from the satellite over a seventh transmitter operating on 136.740 mc. All the transmitters aboard EXPLORER-27 are controlled from the ground.

EARLY BIRD, the world's first commercial communication satellite was launched by NASA for the Communications Satellite Corporation on April 6. The satellite was successfully placed into an almost perfect synchronous orbit, approximately 22,240 miles over the equator above the Atlantic Ocean between Brazil and the western hump of Africa. Appearing as a stationary source in the sky, EARLY BIRD will provide commercial communications initially between North America and Europe, and to other parts of the world at a later date. During April and May the satellite was used experimentally for all types of communications between North America and Europe, including television. It is expected that EARLY BIRD will go into regular commercial operation during the summer of 1965. The communication frequencies used by the satellite are in the microwave region (6 gc from earth-to-satellite and 4 gc from the satellite-to-earth). Telemetry data is transmitted continuously on 136.440 and 136.980 mc.

A communications satellite, called MOLNIYA (meaning "lightning"), was put into orbit by the Soviet Union on April 23. As far as is known this is the first communication satellite launched by the USSR. TASS, the Russian news agency, reported that television pictures were transmitted successfully via the MOLNIYA satellite from Moscow to Vladivostok, some 4000 miles away.

The Russian communication satellite appears to resemble more nearly the TELSTAR and RELAY types launched by the United States a few years ago, rather than the SYNCOM and EARLY BIRD stationary types. It is reported that MOLNIYA is in an orbit which takes it between 300 and 21,000 miles above the earth's surface. Its period

[*Continued on page 94*]

Propagation

BY GEORGE JACOBS,* W3ASK

THE following is a brief band-by-band prediction of propagation conditions for July. For a more detailed forecast of band conditions for distances up to approximately 2,400 miles, refer to the *Short-Skip Propagation Charts* on the following pages. A detailed forecast of propagation conditions expected on world-wide circuits during July appeared in last month's column.

10 Meters: A few DX openings may be possible to southern or tropical areas during the daylight hours. Frequent short-skip openings, between distances of approximately 750 and 1,400 miles are expected to occur as a result of sporadic-E propagation.

15 Meters: Fairly good DX openings are expected during the daylight hours, mainly to tropical and southern areas. Very frequent short-skip openings are forecast, between distances of approximately 600 and 1,400 miles, as a result of sporadic-E propagation. With rising solar activity, some F-layer short-skip openings, up to distances of approximately 2,400 miles, are forecast for the late afternoon hours.

20 Meters: This is expected to be the best band for DX conditions during the month from dawn until well into the evening hours. Fair to good openings are forecast to almost all areas of the world sometime during this period. Excellent short-skip openings are forecast for distances ranging between approximately 300 and 2,400 miles. During most of the daylight hours, while signal levels are expected to be strong, QRM levels will also be high as a result of short-skip and long-skip reception being possible at the same time.

40 Meters: Fair to good DX conditions are forecast to many areas of the world from shortly before sunset, through the hours of darkness, until shortly after sunrise. Static levels will be noticeably higher during July than during the winter and early spring months. Excellent short-skip openings are expected to occur around-the-clock. During the daylight hours, short-skip openings should be optimum over distances ranging between approximately 100 and 750 miles; during the hours of darkness the range is expected to increase to approximately 500 to 2,400 miles.

80 Meters: Static levels are expected to be high on this band during July, but some DX openings should be possible during the hours of darkness. Excellent short-skip conditions are predicted for the daylight hours for distances ranging between approximately 50 and 250 miles. During the hours of darkness, the short-skip range should increase to between approximately 200 and 2,400 miles.

160 Meters: Seasonally high atmospheric noise levels and solar absorption are expected to limit daytime propagation to groundwave distances, generally not exceeding several dozen miles. During the evening hours, fairly good short-skip openings are expected over distances of up to at least 1,000 miles. Some openings considerably beyond this range may occur from time-to-time, especially during the sunrise period.

v.h.f. Ionospheric Openings

Sporadic-E propagation continues at a very high level during July, and a number of good 6 meter openings, as well as some 2 meter openings are very likely to occur during the month. The 6 meter openings are expected to range between distances of approximatly 1,000 and 1,400 miles, with some double-hop openings also possible over somewhat greater distances. Two meter openings are expected to range in distance between approximately 1,200 and 1,400 miles.

The *Aquarids*, one of the major meteor showers, is scheduled to take place during the last week of July. The *Perseids*, another major meteor shower, while generally reaching a peak during August, is also noticeable to a considerable degree during the last days of July. With

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LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for July

	Forecast Rating & Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: **4, 13-14, 17, 28, 31**	A	A-B	B-C	C
Normal: **1-3, 5-6, 9, 11-12, 15-16, 18, 20-23, 26-27, 29-30**	A-B	B-C	C-D	D-E
Below Normal: **7-8, 10, 19, 24-25**	C	C-D	D	E
Disturbed: **None**	D	D-E	E	E

How To Use These Charts

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parentheses at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meanings: A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak with considerable fading and noise; E—poor opening, or none at all.

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—These Propagation Charts are valid through Aug. 31, 1965. These Charts are prepared from basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

this increase in meteor activity, considerable v.h.f. meteor-type ionospheric openings are likely to occur during the last week of the month.

Very little auroral activity generally takes place during July, but some v.h.f. auroral-type ionospheric openings may occur during periods of below normal or disturbed h.f. propagation conditions. Check the "Last Minute Forecast" at the beginning of this column for the days that are forecast to be below normal or disturbed during the month.

Sunspot Cycle

The Swiss Solar Observatory reports a monthly mean sunspot number of 6.8 for April, 1965. This results in a 12-month running smoothed sunspot number of 9.7 centered on October, 1964. This represents a slight drop in solar activity from the almost constant level of 10 recorded for the previous three months, and is the lowest smoothed number so far recorded during the decline of sunspot cycle 19. The date on which the cycle ended and the new cycle (cycle 20) began, is now narrowing down to the period between November 1964 and the early months of 1965.

A smoothed sunspot number of 20 is forecast for July, 1965. 73, George, W3ASK

CQ Short-Skip Propagation Chart

July-August 1965

At Path Mid-Point (24-Hour Time System)

Band Openings Given In Local Standard Time

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	07-09 (0-1) 09-13 (0-3) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	07-09 (1) 09-13 (3) 13-17 (1-2) 17-21 (2-3) 21-07 (1)	07-09 (1-0) 09-13 (3-0) 13-17 (2-0) 17-21 (3-0) 21-07 (1-0)
15	*Nil*	07-09 (0-2) 09-13 (0-3) 13-17 (0-2) 17-19 (0-3) 19-21 (0-2) 21-07 (0-1)	07-09 (2) 09-13 (3) 13-17 (2) 17-19 (3) 19-21 (2) 21-23 (1-2) 23-07 (1)	07-09 (2-0) 09-13 (3-0) 13-17 (2-0) 17-19 (3-1) 19-21 (2-1) 21-23 (2-0) 23-07 (1-0)
20	*Nil*	06-09 (0-2) 09-15 (0-4) 15-20 (0-3) 20-00 (0-2) 00-06 (0-1)	06-09 (2-3) 09-15 (4) 15-18 (3) 18-20 (3-4) 20-00 (2-3) 00-06 (1-2)	00-06 (2-0) 06-09 (3-2) 09-15 (4-2) 15-16 (3-2) 16-18 (3-4) 18-20 (4) 20-22 (3-2) 22-00 (3-1)
40	07-09 (1-2) 09-15 (1-4) 15-19 (2-4 19-22 (1-2) 22-07 (0-1)	07-09 (2) 09-11 (4-2) 11-15 (4-1) 15-17 (4-3) 17-19 (4) 19-22 (2-4) 22-07 (1-3)	07-09 (2-1) 09-11 (2-0) 11-15 (1-0) 15-17 (3-1) 17-20 (4-3) 20-22 (4) 22-05 (3-4) 05-07 (3)	07-09 (1-0) 09-15 (0) 15-17 (1-0) 17-20 (3-2) 20-05 (4) 05-07 (3-1)
80	06-09 (3-4) 09-17 (4-3) 17-21 (4) 21-04 (3-4) 04-06 (3)	07-09 (4-1) 09-17 (3-0) 17-19 (4-0) 19-21 (4-2) 21-23 (4-3) 23-04 (4) 04-06 (3) 06-07 (4-2)	07-09 (1-0) 09-19 (0) 19-21 (2-1) 21-23 (3) 23-04 (4) 04-06 (3) 06-07 (2-1)	07-19 (0) 19-21 (1) 21-23 (3) 23-03 (4-3) 03-04 (4-2) 04-05 (3-2) 05-06 (3-1) 06-07 (1)
160	17-18 (1-0) 18-19 (1) 19-21 (3-1) 21-23 (4-2) 23-05 (4-3) 05-07 (3-2) 07-09 (1-0)	18-20 (1-0) 20-21 (1) 21-22 (2-1) 22-23 (2) 23-05 (3-2) 05-06 (2-1) 06-07 (2-0)	20-22 (1) 22-00 (2-1) 00-02 (2) 02-06 (2-1)	20-22 (1-0) 22-00 (1) 00-02 (2-1) 02-05 (1)

Alaska

*Openings Given In GMT**

TO:	*15 Meters*	*20 Meters*	*40 Meters*	*80 Meters*
Eastern USA	*Nil*	12-15 (1) 22-01 (1) 01-03 (2) 03-05 (1)	07-10 (1)	*Nil*
Central USA	02-04 (1)	13-16 (1) 23-01 (1) 01-03 (2) 03-05 (1)	08-12 (1)	*Nil*
Western USA	02-05 (1)	14-01 (1) 01-05 (2) 05-07 (1)	08-10 (1) 10-13 (2) 13-15 (1)	10-13 (1)

Hawaii

Openings Given In Hawaiian Standard Time†

TO:	*15 Meters*	*20 Meters*	*40 Meters*	*80/160‡ Meters*
Eastern USA	12-14 (1) 14-16 (2) 16-17 (1)	02-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	18-20 (1) 20-00 (2) 00-03 (1)	20-21 (1) 21-23 (2) 23-01 (1) 22-00 (1)‡
Central USA	11-13 (1) 13-16 (2) 16-19 (1)	04-05 (1) 05-09 (2) 09-13 (1) 13-16 (2) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	18-20 (1) 20-02 (3) 02-04 (2) 04-05 (1)	20-22 (1) 22-02 (2) 02-03 (1) 21-02 (1)‡
Western USA	09-11 (1) 11-14 (2) 14-16 (1) 16-18 (2) 18-19 (1)	04-06 (1) 06-08 (2) 08-11 (3) 11-15 (2) 15-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-02 (4) 02-05 (3) 05-06 (2) 06-07 (1)	19-21 (1) 21-23 (2) 23-03 (3) 03-04 (2) 04-05 (1) 23-03 (1)‡

*GMT, or Z Time is 5 hours *ahead* of EST; 6 hours *ahead* of CST; 7 hours *ahead* of MST; 8 hours *ahead* of PST and 9 hours *ahead* of Alaskan Standard Time in the zone between Skagway and 141 degrees west longitude, etc.

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT.

‡Possible 160 meter openings from Hawaii.

"Very funny. Now bring me the heat sink I asked for!"

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

WHEN I used to relax and read *CQ*, a month seemed like a long time to wait for the next issue, but now that I participate with this column, a month seems to have been cut down to about two weeks, or is it just my imagination? Oh well, they say activity is the spice of life.

Awards and endorsements up to May 8th are: Victor, WØGYM received the following awards, USA-CA-1500, USA-CA-1000 and USA-CA-500, all endorsed mixed, his USA-CA-500 was the 3rd issued for a station in Nebraska but his USA-CA-1000 and USA-CA-1500 were both #1 for Nebraska. Other USA-CA-1500 awards were issued to Walter, W8NXN and Pat, W9LKB. Other USA-CA-1000 awards went to Arne, W8DCD; Dave, VE3-11367 (2nd USA-CA-1000 to an s.w.l.); and to Bill, K4ISE. Mixed USA-CA-500 awards went to W1MX (remember famous ole 1XM), W3CDG, K3PSU, Nancy-WA8CGZ, W8DCD, Jeep-K8RCJ, K9CSL, W9ILR, W9UZS, KZ5BX and VE3EVZ. K4ISE and VE3-11367 received USA-CA-500 awards endorsed for Mixed and All 7 mc s.s.b.

New Honor List

There have been many requests for a listing of perhaps the Top Twenty-Five County Hunters, so we will be pleased to give it a whirl. This list is from our records which only show those who have completed applications for USA-CA-1500 and higher awards. I will be glad to attempt to list the Twenty-Five County Hunters with the most counties *confirmed* and I know that will make many changes in this list. But to try to be fair to everyone, I could not print these new changes before the October issue of *CQ*, but please send me your latest list (By number only) of *confirmed* counties by the end of July.

QSO Parties

The Annual West Virginia QSO Party, sponsored by the Kanawha Radio Club of Charleston, West Virginia. Contest starts 0001 GMT July 24th and ends 0500 GMT July 26th. Chance to gain credits for USA-CA, Worked West Virginia Award and The West Virginia Counties Awards. Many rare counties will be active, all bands, all modes. All logs must be postmarked no later than September 1, and go to K8BIT. See CONTEST CALENDAR for full details.

The Third Annual Illinois QSO Party, sponsored by Illinois Chapter No. 17, Certificate Hunters' Club, starts at 1600 GMT Saturday August 7 and ends at 2200 GMT Sunday August 8. All bands and all modes to be used, many Expeditions will be active in rare counties and it is anticipated that more than 52 counties will be active during the Party. Every operator filing his log is placed on a mailing list and will receive a complete tabulation of all scores as well as the announcement, rules and map for the next year's Party. This is a fine chance to gain points for USA-CA and the Illinois Counties Certificate. Logs must be postmarked no later than September 1 and should go to K9EAB. See CONTEST CALENDAR for full details.

This Year's Massachusetts QSO Party, sponsored by the MIT Radio Society, W1MX, on the weekend of October 2-3. Final details have not yet been decided upon, but this advance notice is being given so you will save that date to grab some New England Counties for USA-CA points and also for some of those New England Awards.

Radio Club Publications

Thanks to the many radio clubs for being so kind as to send me their publications, including —*The Tennessee Ham; Key-Klix* from Meriden, Conn.; *SFARC News; Signal Report* of the ARC of Florida and *Florida Skip*.

Letters

Nick Nicholson, W7TSM, of 517 E. Jefferson, Riverton, Wyoming, writes—. . . . "I know of no awards from the state of Wyoming, but will bring it up this summer at some of the hamfests to see if we can't get something going.

"I am located in Fremont County and will be happy to arrange a sked with anyone any evening on 20 or 40. I work 40 every night around 7.100 mc.

"Thanks Ed and keep up the good work in

*103 Whitman St., Rochelle Park, New Jersey.

USA-CA HONOR ROLL

3000

K9EAB 1

1500

WØGYM 33
W9LKB 34
W8NXN 35

1000

W8DCD 76
WØGYM 77
VE3-11367 78
K4ISE 79

500

W8DCD 477
W1MX 478
WØGYM 479
WA8CGZ 480
W3CDG 481
VE3-11367 482
W9UZS 483
W9ILR 484
KZ5BX 485
VE3EVZ 486
K9CSL 487
K3PSU 488
K4RCJ 489
K4ISE 490

SPECIAL USA-CA HONOR ROLL TOP TWENTY-FIVE COUNTY HUNTERS

3000
K9EAB

2500
K8CIR
WØMCX
K8VOF
K5SGK
K5SGJ
WØJWD
VE3-9301

K8IWI
WA9AJF

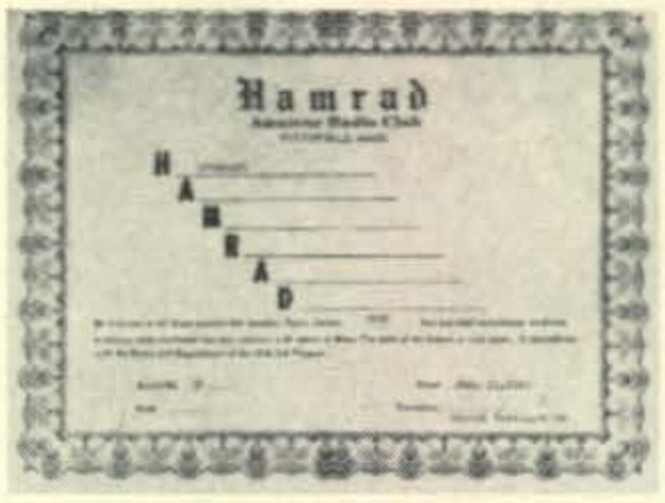
2000
K9UTI
W5EHY
WA8EZW
K8KOM
K8UPH
WØKZZ
K8VSL

K8YGU
WØVFE

1500
K4BAI
W6KG
W5NXF
KØHUU
W9HAS
W9CMC

Maryland VHF Society Award

7-4-11-worth Certificate



HAMRAD Certificate

your column as it's the first article I read every month."

F. Allan Herridge, G3IDG, writes: "I note your mention of TOPS in *CQ* Magazine for April. Your information is over-simplified to the point of being incorrect. Here are the correct details. TOPS is short for TOPS CW CLUB. It was started in 1946 to draw together good c.w. operators to improve the general standard of c.w. operating. Yes, it is a club for c.w. enthusiasts only. The present membership totals 843, comprising 368 in the UK and 475 overseas, and 55 countries are represented.

Your details on sponsoring and dues are correct, as printed. The Club sponsors a number of contests annually, only ONE of which is confined to members only. The Club issues several, not one award, and two of these are available to non-members and they are, Worked All Welsh Counties and British Double Century Award. The correct address for the Hon Secretary is: J. P. Evans, GW8WJ, 2 Ffordd-Ty-Newydd, Meliden, Prestatyn, Flintshire, Great Britain." Note—Glad to print these additional details and correct the address and I will print full details and fotos on the two awards in the near future.

Awards

WAT–GAS, Worked All The Gang At Sitka, is sponsored by the Sitka Amateur Radio Club, their call is KL7FFR. All amateurs are eligible, requirements are two way contact with five (5) or more Sitka area amateurs, except for Southeastern Alaska amateurs who must make eight (8) or more such contacts. All contacts made after January 1, 1965 will count toward this award, the GCR and AOMB/M rules apply. Send one dollar ($1.00) to Marge Dangel, KL7BYA, Awards Manager, S.A.R.C., P. O. Box 219, Sitka, Alaska 99835. A large photograph of the Sitka area proper will be inclosed with each certificate. A partial list of the active amateurs in the Sitka area include: KL7s ANT, BCS, BCT, BCU, BF, BJC, BJV, BLZ, BTO, BUS, BYA, CGC, CPH, DJW, EKF, ESE, ETZ, EMA, FBK, FBU, FBW, FBX, FBY, FBZ, FCA, FCB,, FCP, FFR, RZ, ON and LW.

Hostess City of the South Award, sponsored by the Amateur Radio Club of Savannah, Georgia, is issued for confirmed contacts with stations in Chatham County. First figure for Basic Award and endorsement seals in steps as follows: Chatham County Stations work 10—20—40; others in U. S. work 5—10—20; DX work 3—6—10 (KH6 and KL7 considered DX for award purposes). Basic Award one dollar ($1.00) no charge for DX, send s.a.s.e. for endorsement seals, also available to s.w.ls. Send GCR list to Edna J. Brannen, WA4EPM, 335 Edgewater Road, Savannah, Georgia.

The 7-4-11-Worth Certificate is sponsored by the Pilot Knob Amateur Radio Club, Leavenworth, Kansas. It is available to all radio amateurs for contacts with PKARC members since 1 January 1960, and is also available to s.w.ls. The certificate is awarded in two classes; Class B, North American stations work 7 members; rest of world work 4 members. Class A, North American stations work 11 members; rest of world work 7 members. Endorsements are provided for all one band, mode or mixed contacts. Contacts with PKARC members who are operating mobile do not count. Fee is $1.00 or 7 IRCs for Class "B" certificate, and an additional 30¢ or 2 IRCs for the Class "A" seal. Send log data and fee to Dorsey T. Dobson, WØREU, 1312 Delaware St., Leavenworth, Kansas, 66048. Club members are: WØBGX, BYN, BYP, CGZ, MTP, OAQ, OJT, REU, VQB, VFE, VWV, VZG and YQA. KØAYO, BAT, BQZ, DHV, GUM, HVD, MAC, MYY, OCS, RDC, and WVA. WAØEVD, HLW, HUJ, HUU, IKV, ITV, and JUC. WNØHLZ, HVM, IQL, KEK, KQQ,

WANE Award

WAT—GAS Award

Michigan Screw Ball Certificate

WARI Certificate

Hostess City of the South Award

Orange Award

KSY and KTA. W4IVL, K6BX and KH6BSD. Club hang-out frequencies are: 2nd Sunday each month at 1900 GMT—3.850 & 14.075 mc; 4th Sunday each month at 1900 GMT—7.280 & 14.32 mc.

Maryland VHF Society Award sponsored by the Maryland VHF Society which has created strong 6 meter activity in the Baltimore area. Their award is given for working any five (5) of their 106 members who are mostly in that area with a few around the rest of the state and in nearby Delaware and the south end of Pennsylvania. Send log data to Henry Hickman, K3MMR, 108 E. Seminary Ave., Lutherville, Maryland 21093. All contacts must be after July 1st, 1963 and there is no charge for the award. A "CQ to any member of the Maryland VHF Society" will usually bring many replies to the caller.

HAMRAD, sponsored by the HAMRAD Amateur Radio Club of Pittsfield, Massachusetts, is issued for working towns in Massachusetts starting with each letter of HAMRAD (Name of the Club). There are at least 22 towns in Massachusetts for each letter of the club name. QSOs after WW2 with no time limit are OK. Send GCR list (Not QSLs) and 10 IRCs or $1.00 to Club Custodian, George F. Martin, K1TNB, 15 Maple Street, Dalton, Massachusetts.

Michigan Screw Ball Certificate issued by WA8BGU, Al Mann, Box 83, Paw Paw, Michigan. Requirements: Any station within 50 miles of Keeper of Screws and Nuts, WA8BGU, work 6 Charter Presidents or Members; all others work 4, except those outside continental U. S. (Including Alaska, Hawaii and Puerto Rico) work 1. Send GCR list and postage for certificate to WA8BGU. Among the active members are: W8PX, QNS, SEW; WA8BGU, CRV, DFJ, DOE, HAA, HJR, HVN, LUQ, LWO; K8DFI, IXU, IZA, JRY, KEA, NFA, OEA, OEG, TBG, TYC, TYD, ZAJ, ZWR, and ZXT.

WANE, Worked All New England Award issued by the Port City Amateur Radio Club of Portsmouth, New Hampshire, is available to ALL amateurs, no time limit, all bands and all modes ok, but contacts with mobile stations are not valid. Contacts must be made from the same state or county. Basic award issued for proof of contacts with at least 50 of the 67 counties comprising the New England States of Maine (16), Rhode Island (5), Massachusetts (14), Vermont (14), New Hampshire (10), and Connecticut (8), and all 6 States must be represented. Additional endorsements by stickers for 62 and all 67 counties are available. Return postage for QSLs must accompany application and please send one of your own QSLs to Port City Amateur Radio Club, P.O. Box 622, Portsmouth, New Hampshire 03802.

WARI, The Worked All Rhode Island Certificate is issued by the ARA of Southern New England. Requirements: Proof in the form of QSL cards of two way amateur radio contact with two (2) radio amateurs in each of the five (5) counties of the State of Rhode Island. All band, all modes ok and contacts on or after January 1, 1957 will be honored. Send QSL cards and return postage (No other fee) to Club Secretary, Chester P. Tammany, 119 Owen Ave., Pawtucket, Rhode Island.

Orange Award, issued by the Orange Amateur Radio Club, Inc., of Orange, Texas, for working members after January 1, 1964. Working Club Station, W5ND, counts 2. W/K stations work 5, DX stations work 3, Orange County stations work 10. There is no charge, AOMB.M. Send GCR list with log data and s.a.s.e. to custodian, Nancy Gunstream, K5VXP, Rt. 3, Box 24, Orange, Texas, 77630. Members include: W5ANV, APE, ICL, NMV, QEY, THD; K5AVN, BBN, BJB, HMB, MSS, PCT, ROA, RZB, VXP; WA5AUZ, COD, CVB, DIK, GYQ, HBD, IPG and LFS.

Silent Key

We at *CQ*, are saddened by the sudden death of an old friend, Al Ferres, at the age of 54. Al, although not an active ham, over the years wrote several articles for *CQ*, and his technical advice to his fellow employees at radio broadcast station, WHN, helped them solve many of their problems with their ham rigs.

Again, many thanks for all the wonderful letters, so many saying how pleased they are with fast service and many with so much encouragement and help. How was your month?

73, Ed., W2GT

See how many new counties you can pick up by entering the New Summer VHF Contest on Aug. 7.

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

CQ Summer (12-hour) VHF Contest

The 1963 12-hour VHF contest made *CQ* history with its record-breaking participation. Now it's back for keeps as our new *CQ* Summer (12-hour) VHF Contest. It runs from 9 A.M. to 9 P.M. local time Saturday Aug. 7. Any number of operators. Competition *by band*. Special power multipliers. No contest hangover. See page 61 this issue and write for logs today!

WHAT with the Summer CQ VHF Contest just around the corner, it seems timely to discuss operating procedures, or rather tactics, that have kept contest participation down in recent years. It is a well-known fact that only the extremely avid operators bother to take part in these annual competitions, and many feel that even their numbers are diminishing. Why? Perhaps the excitement is too much to bear for many, or maybe the over-anxious get plain carried away, but whatever the cause, the result is deplorable.

Although unable to actively participate in the May contest due to other pressures at hand, both K2UYH and K2ZSQ did operate for short periods of time to provide counties for the real participants. A full twelve hours, however, was spent by K2ZSQ just listening to the bedlam in the N.Y.C. area. The outcome of these observations, which consisted of scattered notes taken at random on six meters, quite frankly would be enough to make anyone throw in the towel.

To illustrate, let us assume that WB2XXX was just winding up a contest QSO with WA3-XXX. The WA3 was doing the honors.

"Well, 73 Jim and be looking for you after the contest. WB2XXX this is . . ." . . . "K3XXX calling WB2XXX and standing by." This tactic is commonly referred to as *'tail-ending.'* The listener is caught by a new station overly anxious to establish contact and too impatient to wait until the previous QSO has been completed.

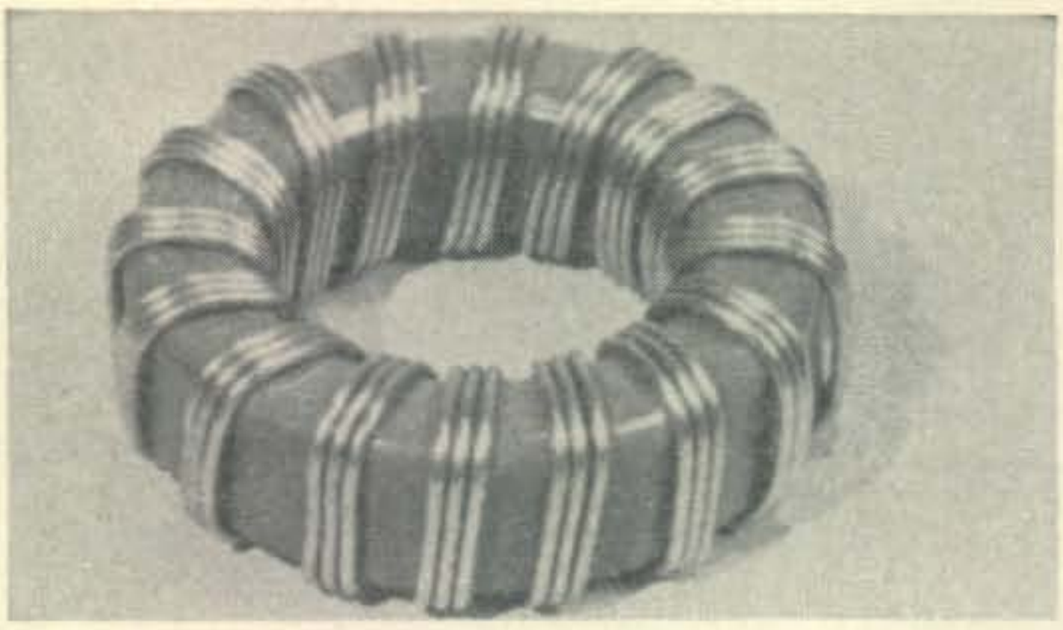
In many instances, the WA3, for example, is still waiting for a final roger from the N.Y. station when he hears WB2XXX coming back to the K3. He doesn't know how much of his transmission was wasted breath, or if he was heard at all. In fact, he often hesitates to log it as a confirmed contest contact. And no wonder. ARRL Official Observers have had a ball with these boys, since tail-ending is nothing more than direct malicious interference.

Another discouraging tactic is to hear a swishing v.f.o. being employed to clear the freqency when a contester wishes to return to the low end. He finds his beloved "lucky" frequency already occupied, and feels obliged to reassert himself. "Ahhh, CQ contest, Ahhh, CQ contest," is the next thing heard, with a rumbling zero beat detectable underneath. "Ahhh, CQ contest" goes on intermittently while the operator quickly checks the frequency to see if his goal has yet been achieved. One of these boys was clocked with the "CQ contest" bit for a full seventeen minutes at 50.106 mc. He identified only once. When he ceased, the frequency had indeed been cleared, but he received no reply. Apparently those amateurs who didn't know what he was attempting to do got tired of waiting for him to sign. And to make matters worse, the band opened briefly to the South while he was transmitting!

The above tactics are also applied on a round-table net frequency where a contester has been either refused temporary admission to the group (so he can collect points) or went unrecognized. The infuriated contest boy decides to get even, and force them into submission.

This young team from Tennessee racked up an impressive score in the May contest and will be back at work next month in the August 7 affair. At the controls is Bill Conner, WA4VSU, (who was in QSO with a Colorado station on six when this pix was taken) with Bobby McCallie, WA4VAW, waiting his turn. May scores will be revealed next month.

*c/o Allen Katz, K2UYH, 48 Cumberland Avenue, Verona, New Jersey.



Appearance of Amitrons balun when wound as instructed

offers his equipment via his ad as "comes in original cartons" that you are getting equipment that has not been used. To the contrary.

Remember that *original* cartons are the best means for packing your set for shipment and should be obtained and used whenever possible. But do not get the idea that "original cartons" means "the set was used by a little old lady ham only on week-ends."

The ad that reads, "needs some work," indicates caution. How much work?

Then of course be careful when you read the ad that goes like this: "make me an offer." Here's a guy who is trying to "milk" as many dollars as he can from some ham by virtually setting up a "lottery." There is a fair price and the offerer should state it.

The ad reading, "must sell because of this or that" means nothing. When a price seems too low, be careful! You get what you pay for. Read "behind" the ad lines and contact the offerer. If necessary, make a deposit to hold the item *if* the offerer will accept the deposit in writing.

Finally beware of the ad that states, "will send set to person sending *first* check received." This is no way to do business.

If You're "Taken"

Sorry to say, although the *majority* of hams are honest and will not cheat a fellow ham, there always seems to be a few "bad apples" in every barrel.

If after trying a courteous approach to obtain satisfaction from someone who has sold you a "lemon" and this does not work, then I would advise you to engage a lawyer. If the amount of money involved does not warrant this, then write or contact the Better Business Bureau in the area of the seller. Sometimes a letter to the Chief of Police will "shake up" the ham who seems to be too slow in responding to your requests. But remember this: before any legal action can be taken against the seller you had better have proof that he is in the wrong, or you might find yourself with a countersuit on your hands.

Most hams will go out of their way to give another satisfaction on an equipment deal if approached *properly*. On the other hand, it is the buyer who should take the necessary precautions (some of which have been mentioned here) *prior* to a purchase.

Satisfaction from dealers is usually easy to obtain, but if it is not, and you are in the *right*, the Better Business Bureau will be happy to step in and help.

Questions

Making Baluns—"I need a balun that will enable me to match a 300 ohm line to a 50 ohm pi network, or 300 ohms to a 75 ohm termination (un-balanced). What is the best way to go about this? The balun must handle at least 450 watts and be a broadband device."

I would advise you to buy the toroid balun kit made by Ami-Tron Associates, 12033 Otsego St., North Hollywood, Calif. This special kit sells for only $5.00 and you can make a good balun having a 1:1 or 4:1 ratio that will stand over the 500 watts they claim it will handle. The balun uses a special r.f. core and comes with special wire.

Schematic Drawing—"Like many other hams going to college and studying radio-electronics, I have to draw a lot of schematic diagrams, and these are my biggest headache. Currently I am using templates that are slow and I need something to help me speed up my work. I'm not the world's best draftsman I can tell you. Any suggestions?"

Recently, a firm called the Datak Corp., 63 71st St., Guttenberg, N.J. came out with an Instant Lettering (R) dry transfer electronic symbol drafting set. It is absolutely the best I have ever used and am using. "Drawing" diagrams of professional quality is easy. Thousands of symbols are available that are transferred to paper merely by rubbing them with a ballpoint pen then burnishing. The result is a clean, uniform drawing. The set sells for $15.95 and is well worth it to the ham, student, design engineer or technical author.

Q Multiplier for High i.f.'s—"My receiver uses an i.f. of 1650 kc. I'd like to add a Q multiplier. I find no Q multipliers on the market for such a high i.f. Can you help me? If so, please make it simple."

See fig. 1. This Q multiplier should meet your requirements. After installing check the i.f. alignment of your receiver. I suggest that you mount the parts in a Mini-box for good shielding. Any voltage from 75 to 150 volts will work fine. Although a 6C4 is used in the circuit you can use if you desire, a nuvistor such as the 6CW4 or 6DS4.

Photo-Stamps for QSL's—From some of my readers who regularly write to me I have been receiving letters, QSL and other cards on which they have attached a photo-stamp of themselves.

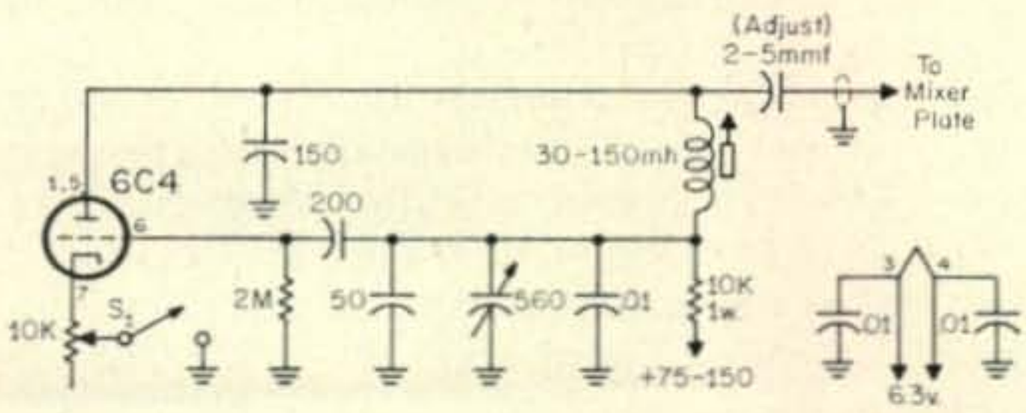


Fig. 1—Q multiplier for an i.f. of 1500 to 1650 kc.

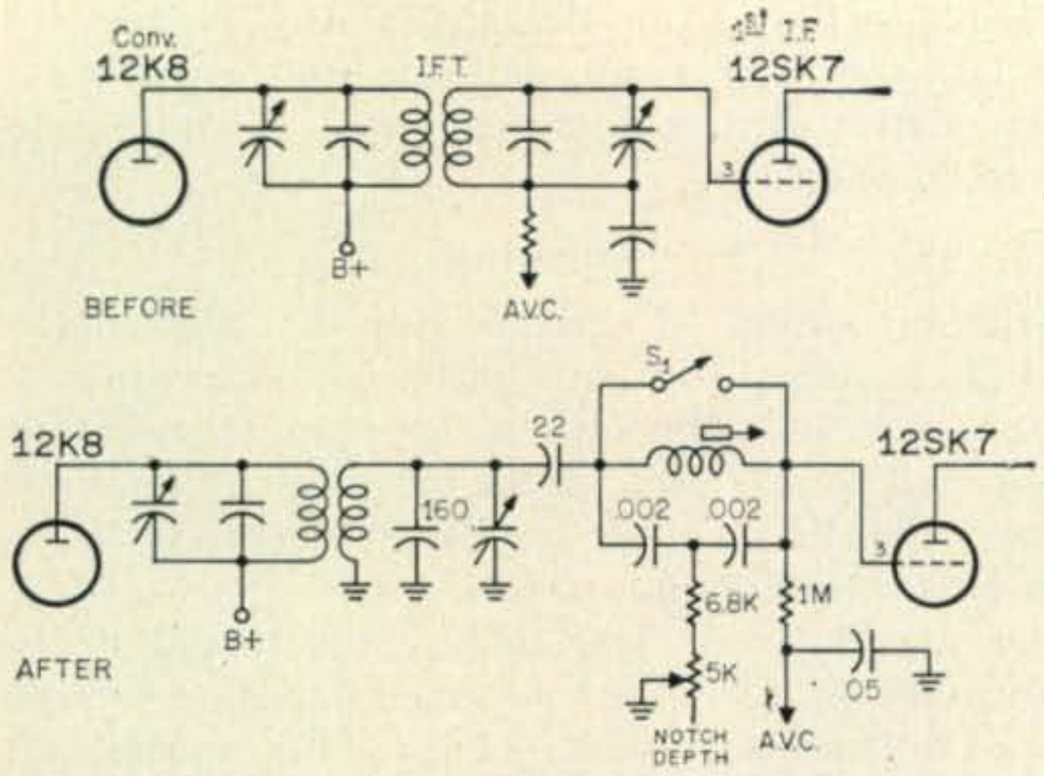


Fig. 2—How to add a T notch filter to a BC-453 surplus receiver.

It's nice to see what the other guy looks like! Looking into the situation I found one can obtain photo-stamps from Classic Photo Service, 54 Warrenton Ave., Hartford, Conn. for as little as $2.75 per 150 stamps. All that is required is a good negative or a photo of you and/or your station. Your photo or negative is returned. If you want 1000 stamps they cost $12.50.

Adding a T Notch Filter to the BC-453—Thanks to H. I. Johnson, WØJGQ of Remsen, Iowa, here's how you can add a T notch filter (TNF) to your BC-453 receiver with fine results.

Fig. 2 shows the before and after circuitry.

The TNF coil *L* can be any TV width or linearity coil from an old TV set. The capacitors across the coil are disc ceramic types, and can vary in capacitance from .002 to .0033 mf. The notch depth adjustment can be quite critical. After installation adjust coil *L* and the notch depth control (5k pot) alternatively while listening to a heterodyne and leave the control set for maximum attenuation.

All parts were mounted in a cluster at the left front of the BC-453. A shaft was made for extending the control (iron slug) of coil *L*. Coil *L* itself was mounted on a bracket around the metering or headphone jack.

Using a little mechanical ingenuity the installation of the TNF should be an easy job.

Attenuating v.f.o. Signal Output in a Mixer—"What kind of a mixer can I use so that the v.f.o. signal will be attenuated or not be present at all in its output?"

A balanced mixer. Fig. 3 shows an old standby. The capacitor across both plates enables one to null out any remaining v.f.o. signal.

Counterfeit Transistors—In recent months there have been reports of the counterfeiting of transistors. Make sure you buy your transistors from a reputable dealer or distributor, so that you will be getting what you pay for.

Book Browsing—If you are interested in using high voltage silicon rectifiers one of the best books you can obtain is called *High Voltage Silicon Rectifier Designer's Handbook* obtainable from the Westinghouse Electric Corp. Semiconductor Division, Youngwood, Pa. ($2.00).

This book is a wealth of information. Especially interesting to hams is the conversion

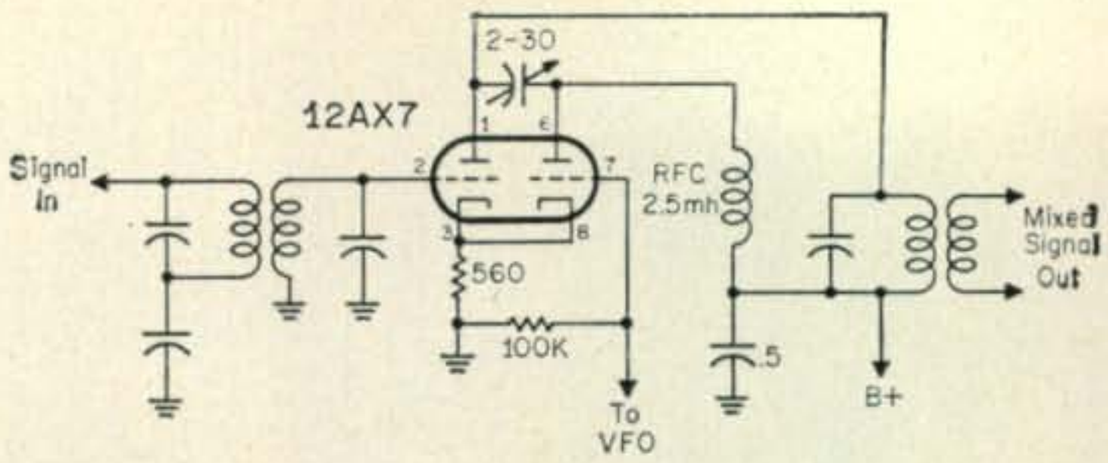


Fig. 3—Balanced mixer with very low v.f.o. output signal.

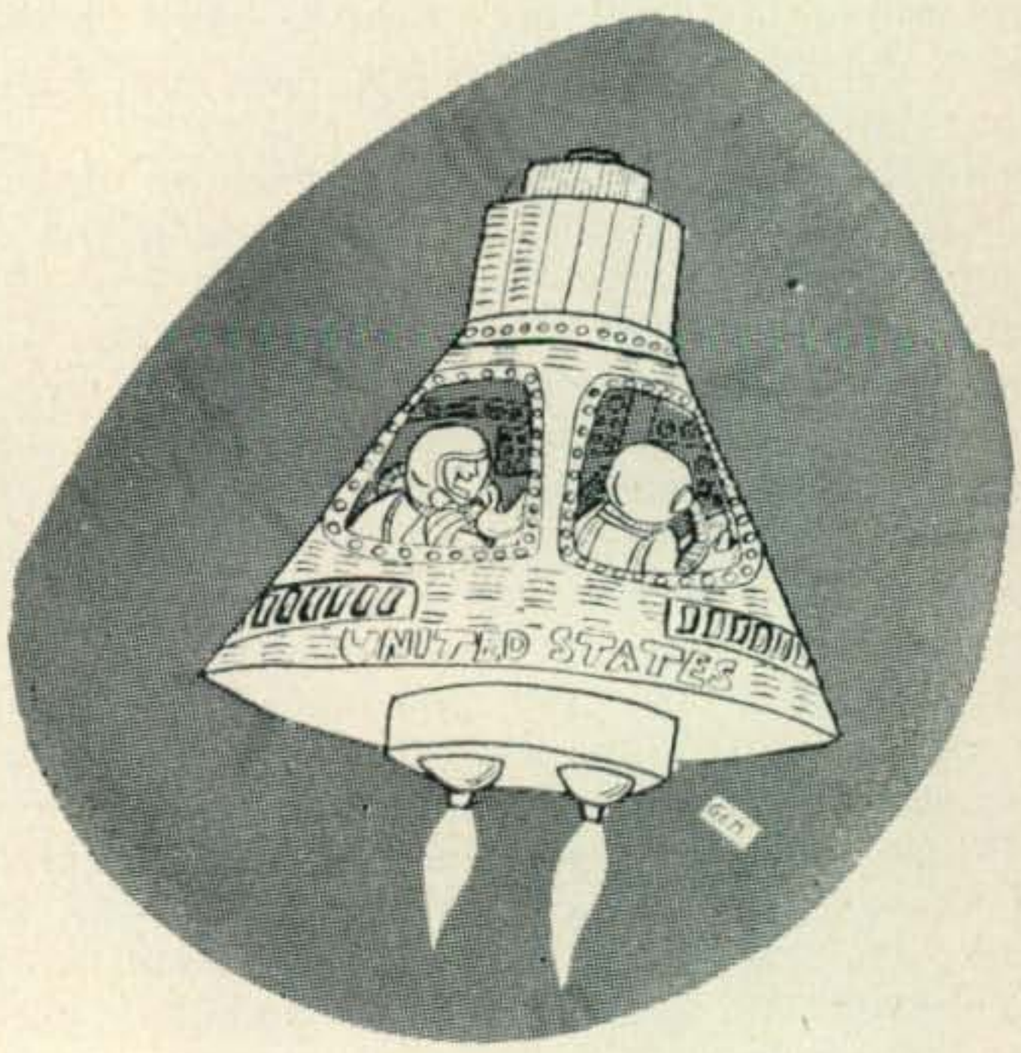
information on pages 7-92 through 7-98 on the Collins 30S-1 and KWS-1. This information shows how silicon rectifiers are used to replace the rectifier tubes resulting in less heat and higher efficiency.

If you build your own power supplies and are interested in using silicon rectifiers you should have this book—it covers the subject thoroughly and was compiled by 5 experts.

Another s.s.b. Handbook—The Philco Techrep Division P.O. Box 10, Fort Wash. PA (19034), is offering their new *SSB Communications Handbook*. This is a much better book than their 1957 edition and covers the s.s.b. field in a commendable manner. It is easy to read and to understand and has not only been written for the radio amateur but the communications engineer as well. It is well worth the price of $4.50 and is a valuable addition to any ham's technical library.

Thirty

Is a personal answer from HAM CLINIC worth two IRC coupons (available at your postoffice) or 25¢ in coin to you? We hope so! We feel that our time is worth more than that, but all we ask is that you send us the proper amount of postage. Your letters can go directly to *CQ* (and these are forwarded to me) or you can send them to my present QTH given in nearly every issue (4 Lutzelmatt Str. Luzern, Switzerland). Happy summer holidays! 73, Chuck, W6QLV



"Did you have enough time to attach the halo?"

NOVICE

WALTER G. BURDINE,* W8ZCV

THERE is an old saying "The wheel that squeeks gets the grease." Paraphrased it can be said "The guy that's always griping and belly-aching will eventually get some one to take note of his terrible predicament." The following is based on my observations. I have listened in on the bands for quite a while, to all the belly-aching and name calling that has been going on, and often have wondered what the Castros and the Hitlers of the amateur bands were going to get for their troubles. I have mentioned this in our column a few times and no one listened. Now we are waiting to find what new kind of license we are going to have to get to keep our calls as they are. The new amateur doesn't have to worry what kind of call he gets, it will be new to him anyway. The old-timer, even a newcomer like myself with only twenty years on his call, will have to get used to a new call sign. Actually the only incentive I will need for my license is the one that will permit me to use my old call, W8ZCV. I don't care for a two letter call, I don't care if I talk to a Novice, Technician, First class or Extra class license. I don't like to have a call letter assigned to each class of licensee, that looks like discrimination to me. I guess you can all remember the third class ham that always called CQ and mentioned that he would only talk to class A licensees, I wouldn't talk to him if he were the President of the United States. The next thing will be some one wanting a distinctive call assigned for each religion and next possibly an assigned frequency for each ham. When it comes to this I'll take up *girl-watching* and give my call to someone else. At least I hope you got your 25 kc, it wasn't too crowded anyway and now you may have to talk to some general to get a QSO, gee whiz, how degrading. Maybe I'll get back my inferiority complex.

Bill Collins, WN1CFK, 4 Kirk Street, Methuen, Massachusetts writes that the Tenney High School radio club is planning to send up a helium-filled balloon carrying a twenty pound pay-load consisting of a camera and possibly a two meter transmitter. They estimate that it will reach an altitude of twenty thousand feet and will remain aloft for about two weeks. Plans are for the keying system to key a beacon signal and a telemetry signal. It will send back information on temperature, altitude and humidity. They plan to launch it in July and would like to have some hams to help track it and report its telemetry signals. Write Bill if you are interested.

Bill don't forget to clear with the FAA for any possible interference to aircraft flying in the vicinity, twenty pounds could cause quite a shock if an aircraft should run into it. Good luck with the project.

*R.F.D. 3, Waynesville, Ohio 45068.

High School Radio Clubs Take Note

The Elkhart High School Radio Club is making a list of all High School Radio Clubs along with their club calls. This information should be sent to K9IXS, Elkhart High School, Elkhart, Indiana. 46514. At present they have 50 clubs registered with them and they would like to make it a complete listing.

QSL? — QSL

Many of the letters that come to me ask the simple question—"How can I get a QSL from XXX?" "Why is it so hard to get QSLs from Russia?" "If you need QSLs to get an award, why don't they QSL?" Another ham says "I QSL 100% yet I do not have HIS card in my collection and I have worked him at least fifty times. Why?" Yet I have worked a very few that told me they could not QSL due to a number of reasons and I must say that I appreciate their truthful statement rather than the promise of a QSL when they knew they did not intend to QSL. I have always sent a card to these because I knew they were among the few people with intestinal fortitude to stand up and tell the truth.

QSL in the beginning did not mean a small card with information about the station that you have just worked. In telegraphic parlance it was written thusly: QSL?—Can you acknowledge receipt? QSL.—I am acknowledging receipt. As with all Q signals it was just a form of c.w. shorthand to speed communications by telegraphy. I understand that Q signals were to be used on c.w. only and not a substitute for the language of the land when on phone.

Sometime in the early twenties an amateur using the call 8UX originated the idea of sending a card to the amateur as an acknowledgment of the completed QSO. Thus, was born the QSL card idea and it has stuck. The card is supposed to be of standard size and to have enough information on it to tell the recipient the details of the contact. The card usually has the call of the sender in large letters so that it will show up well on the wall when displayed. It will have the additional data on the band, mode of communication, signal strength (quite often padded) the date of contact and the name and address of the sender. A good collection of QSL cards not only shows the activity of the ham but is an education in itself. The certificate hunter will know more geography than most school teachers, he will learn more about the country than he would by traveling the highways and byways of the land because he has a friend in the faraway places that he would never visit otherwise. Certificate hunting will teach more geography than

I must say this is about the neatest DX corner that has come to my attention. It belongs to Arthur Castrup Jr., WN9NKV, R#2, Bretz Street, Huntingburg, Indiana, 47542. Surplus panels and a lot of work has made this neat layout. Art likes the lending service as mentioned in the March CQ.

any other hobby. QSL cards must be obtained to win these certificates. They mean: I acknowledge communication with this station in Warren County, Ohio. And that is only one of the 3079 counties of the good old United States.

The first data I have been able to find on the QSL card hobby was written by another *CQ* contributor, Howard S. Pyle, 8FT, now signing the call W7OE. It is in the September 1924 *QST* page 36. By the way, I understand that the Call, 8UX has been used by three different people, two of whom still live in Dayton, Ohio. The original first holder of the call, then Virda Hiles, EX-W8ATT, now K8TKL and the present holder W8UX, Bill Hinman. I often wonder if the holder of the original 8UX is still around.

One of ham radio's biggest problems is working DX and then getting a QSL confirming the contact. Back when I first started in ham radio you could put more dependence in a ham's word that he would send you a QSL if you asked for one and sent him one. I believe the ham fraternity was a more closely knit group then than now. I was an s.w.l. for many years and I could always depend on the c.w. ham to QSL my report. I have been very lucky in receiving a high percentage of returns for my QSLs. I need two countries for DXCC and about 4 states for WAS YL phone. I especially would like to receive a card from CR5UP (now CT1BW) and the only TF5 that I ever worked. So you see I also have troubles. Never-the-less I can't say that I haven't had good return percentage on the cards sent.

Letters to the Editor

"Dear Walt: I am a general class ham in the Navy aboard a ship. I was recently transferred from Puerto Rico where I was K6OZL/KP4 but I am now in Cape Town, South Africa. With what little time I have to do s.w.l.ing I have divided my time between listening for DX on 20 meters and listening for novices on 40 meters.

"Below is a list of stations that I heard off the coast of Mozambique (CR7). Overall the stations were weak with the exception of WN3BNT and WN6LFM. If you can publish their calls in CQ I'm sure they would get quite a kick to know their signals were being heard in South Africa on 40 meters. Most stations were copied when sending CQ.

"The following were heard on 7.0 mc on January 22, 1965. WN3CDK, WN4UBK, WN4WJO, WN5LMG, WN4VLT, WN3BNT, WN5KWB, WN9MHS, WN6LFM, WN7AFF, WN8MNR, WN2NLN, WN4VZO, WN8NGJ, WN5KXJ. February 3 . . . WNØJND, WN6NCH, WNØKSY, WN4VSZ, WNØIVR, WN1DJN/5, WNØJII, and WNØIOK.

"I might say well done to the fellows that are able to get down to Africa on 40 meters. The best frequency seems to be around 7.170 kc for this section to escape foreign broadcast stations. 73. Ron." This from Ron Hill, K6OZL/ZS1, SWL.

You see if the required treaties were signed between The Union of South Africa and the United States to permit reciprocal licensing, Ron could be on the air and working the fellows on 40 meters. I am glad to know that the Novices are getting down to Mozambique on 40 meters as this shows that low power can work them on 40 and who knows, maybe 80 meters. I get a lot of letters of novices working DX on 15 meters but very little on 80 and 40 meters. Thanks Ron, I surely appreciate your nice letter. I'm sure the novices will be glad to know that they are being heard half way around the world on 40.

A letter and four cards have come in from my old friend and yours, F. Allan Herridge, G3IDG, 96 George Street, Basingstroke, Hamshire, England. He sends a list of about 65 novices heard on 15 meters and he has had QSOs with many and says it is nice to be their first G contact and again he says use the QSL bureau for QSLs as the cost of QSLing amounts to considerable when QSLing direct.

Bill Waddington, WA7BCD, 716 Clover Court, Cheney, Washington sends this newsy little note. "Dear Walt: In almost every NOVICE COLUMN I see a call for letters and pictures, so I decided that it was about time for me to write my first letter to your column. I have only had my conditional license for about five months and I don't have any superduper gear but I do enjoy building a lot. I run 120-watts homebrew on 80 phone and c.w., and an SCR-522 on 2 meters. The receiver is an RME-84 and for two meters I use a Centimeg converter. I am wondering if there is anyone in the Cheney area that could get on two meters but does not know that we are on the air on two. The Heath twoer makes the distance from Spokane here very well and that is 18 miles.

"I saw your call for favorite projects so I thought I would tell you that mine is pi-net interstage coupling between stages. I had trouble getting enough drive for my 6CD6 final in my 80 meter transmitter. I tried rfc-capacitor coupling and also parallel-tuned circuits but still couldn't get enough drive. The pi-net coupling appears to give about twice the amount of drive in a standard

Eight years old, Todd Sharp, WN8PBE forgot to tell me where he is located. He says he has all homebrew equipment, 50 watts on 40 and 80 meters with a Heath AR-3. Detective work: looks like Boy Scout troop 36, Cleveland Hgths, Ohio. Todd's ambition: To get the general and operate dad's Viking II and SX-28.

circuit, and since tuning is broad I can QSY anywhere in the band without re-tuning the stage. I am including a diagram.

"I also favor TV tubes for use as amateur finals. My 6CD6 from an old TV runs 200 mils at 600 volts, a 6146 at this voltage runs about 120 mils and gives about half the output.

"I really enjoy your column and all the rest of *CQ*. I hope to work you sometime on 80, Walt. 73. Bill."

From Bob Migliorino, K2YFE/KL7, HHC-1 Bn (M) 47 Inf., APO Seattle, Wash. 98731 comes this letter. "Dear Walt: Although I am not a Novice, I think the boys will be interested in this. When I operate our station KL7WAH, I regularly get on 40 and 15 meters for the Novices. I listen for new Novices especially. Some people though don't listen. I called CQ on 7160 one night for one half hour with no takers. I then called a WNØ and a WN6; The Ø said there was no such call as KL7 and the six kept calling me a K7. However, I do work the boys often and one fellow sent me 24 PSE QSL's in a row. I can not keep skeds due to duty hours but will be listening. I also get on 7205 or 21.256 s.s.b. and listen in the novice bands. I QSL 100 percent so I hope the boys who need Alaska will listen a bit more carefully. The rig is a Collins S line. 1 kw the antenna is either a dipole or a 4 element beam. C U from Fairbanks, Alaska. 73. Bob."

Thanks for the letter Bob and from the letters that I receive I am sure that the boys and gals are not digging down in the pile for the DX stations that are calling them. I know from experience that it pays off in DX to listen more than making calls of CQ DX and then going back to the fellow two blocks away.

This is the kind of people that makes ham radio interesting, read it and see why. Can't you read between the lines? Well read anyway and be proud of hams like Mike Russell, WN5LKM, 11 Circle P, Orange, Texas.

"Dear Walt: Greetings! I just thought that I'd like to write you a letter. I think you have an excellent column and it is always read first.

"I received my Novice license last December. Because of a back operation in October, I have had to stay in bed flat on my back until sometime in May and ham radio has sure helped to pass the time in bed. I use a homebrew rig made by two of my friends who hold their general license. The rig runs 23 watts on 40 meters and 18 watts on 80 meters and 15. I use a Drake 1-A for hearing aid with an inverted V antenna. With this set up I have worked about 32 states, Canada, Puerto Rico, Venezuela and the Canal Zone.

"I was wondering if you would know where I could get a DX-100 kit? I would like to build it up for when I get my General this summer.

"Sorry I didn't send a picture but I have been in bed since I got my license due to the operation.

"I would be glad to help anyone in the Orange area to get their license if they could get in touch with me. I am using the Ameco theory course and I wonder if there is any better.

"So long for now and I would be glad to have an on the air QSO. I am 14 years old. 73. Mike."

Help Wanted

If you need help with code or theory or finding a volunteer examiner send a letter to me and tell me about it and I will put it in the column. Ask your friends and see how successful we have been with our help column.

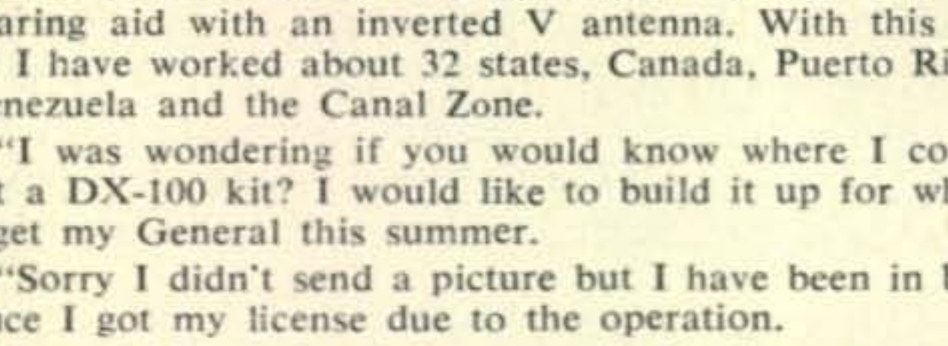


Fig. 1—Pi-net interstage coupling method to get grid drive for his 80 meter c.w./phone rig. This circuit sent in by Bill, WA7BCD. L_1 is made of 30t of #30e on a ½" form.

Thomas M. Turner, K6VBL/6, U.S. Naval Hospital (Staff) Oakland, California uses an NC-101-X and a James Millen exciter with a transistorized v.f.o. from the CQ *Command Set Manual* (you mean you don't have one, huh) and says it works very well. One of his problems is interference from television, ITV. C.w. is his mode of communication and he will be looking for you.

I have been told a number of times about the fine folks that read NOVICE that they have had plenty of offers, many of them from overseas. You see hams are the same all over the world. The shoe also fits the other foot, many foreign hams have written and told of receiving help from we hams in the states. We definitely are talk-about the finest group of hobbyist in the world, the ham, regardless of race, color, creed, religion or grade of license. I am proud to be numbered among such nice people.

Robert Miller, needs a volunteer to give the examination and possibly a little help with code and theory.

James L. Campbell, Dry Run, Pennsylvania 17220 would like a local to tell him the facts of life as a ham, he wants to 'jine' our society. Tell him fellows.

James Pogue, 410 S. Main Street, Farmland, Indiana would like some help with code and theory.

George Blahun Jr., 15, 451 Mohegan Avenue, Quaker Hill, Connecticut wants a penpal interested in radio and in becoming a ham. He is studying for his novice.

David Logan Birkhead, c/o Major H. C. Birkhead, 52380A Headquarters Sqdn Sec. Box 157, 7030th Combat Support Wing, APO 12 New York, New York, 09012, would like for a local ham to contact him. He wants to be a ham very badly.

Mike Singleton age 15, 1107 North Rongold, Janesville, Wisconsin, phone: PL 2-9114 needs help with code and theory.

John Ocak, 13, 1213 Dayton Street S.W., Grand Rapids, Michigan would like to join a radio club in his city. He needs help with code and theory.

Bill Waddington, WA7BCD, 716 Clover Court, Cheney, Washington would like to hear from anyone in the Spokane area that is looking for a two meter contact. He says there should be more two meter activity in his locale.

Stan Rogrer, W9FQN says the Elkhart (Indiana) High School Radio Club would like to hear from any high school radio clubs that would like to join a net of school stations. They have the club call, K9IXS.

That just about writes finis to our space this month. I would like to thank all of you that have taken the time to write and especially those that sent pictures for this month, I will have enough for next month. Don't you think the pictures make our column look a lot nicer? I will publish any pictures that you send in for the column and it surely is nice to see the way your rigs look. I might say that I am preparing to finish my ham shack before long and the pictures received this last month has helped me out with my problems. Wait till you see those for next month and you will see what I mean. Some time in the near future I will publish some pictures of my new station and shack. Keep on sending the letters and the pictures, we need them. One picture is worth a thousand words, how about a few thousand words from you? Thank you. 73, Walt, W8ZCV

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc on h.f.

80 meters		3620 kc
40 meters		7040 kc
40 meters	(narrow shift)	7140 kc
20 meters		14,090 kc
15 meters		21,090 kc
6 meters		52.60 mc
2 meters		146.70 mc

SINGLE channel radioteletype, in practical usable form, was born during the fast-moving World War II years. Your RTTY Editor was fortunate enough to be in on this right from the start, and the start was as a Signal Corps instructor (in uniform) at Fort Monmouth,, N.J., around 1943, 1944. The course in SCRT taught was "SSN 792." Later it was combined with another, then new, course (SSN 649) in Fixed Station Radio Equipment, which included high power transmitters up to 40 kw.

The SCRT course included an r.f. exciter, the O-5/FR, which replaced the usual crystal oscillator in a transmitter so that an f.s.k. signal could be transmitted. The receiving equipment included dual-diversity receivers such as the Press Wireless AN/FRR-3 and the Wilcox CW-3D. The Terminal Unit, designed at Bell Laboratories and first built by Western Electric, was the fabulous monster, the AN/FGC-1, a dual-diversity audio type of converter. The AN/FGC-1 without its companion receivers completely fills a 7-foot WE rack cabinet, the whole unit weighing 425 pounds—uncrated. Many other smaller and lighter surplus RTTY converters have been used since, such as the URA-series and the FRA/FRE series. None of these approach the performance of the AN/FGC-1. In professional circles the diversity combining system of the AN/FGC-1 is still considered tops by many.

*431 Woodbury Road, Huntington, N. Y. 11743.

The AN/FGC-1, Part I

Why would the amateur RTTYer want to use this monster? How would he use it? The first question each RTTYer will have to answer himself. The second we will try to answer. (The AN/FGC-1 can be bought for $50 to $125 F.O.B., depending upon condition.) What does its use buy? The answer to this question is, "Nothing, if the dual-diversity feature and the a.f.c. are not used." In other words, the casual RTTY operator can get along fine with a little transistorized TU weighing just a pound or so. The *real* serious RTTYer, perhaps the traffic handler who holds skeds at certain times with certain stations at particular places, *can* enjoy better copy if he uses the AN/FGC-1 as it was intended to be used. This means in *diversity*.

Perhaps a word or two about diversity reception is in order here. Briefly, better copy (fewer errors) can be had by making use of the principle that a radio signal seldom fades at the same time at different locations, even if the difference is slight. Commercial long distance communication services use antennas separated by many wavelengths, perhaps 10; and, separate receivers with common oscillators, combining the signals after separate detection in each receiver. Very

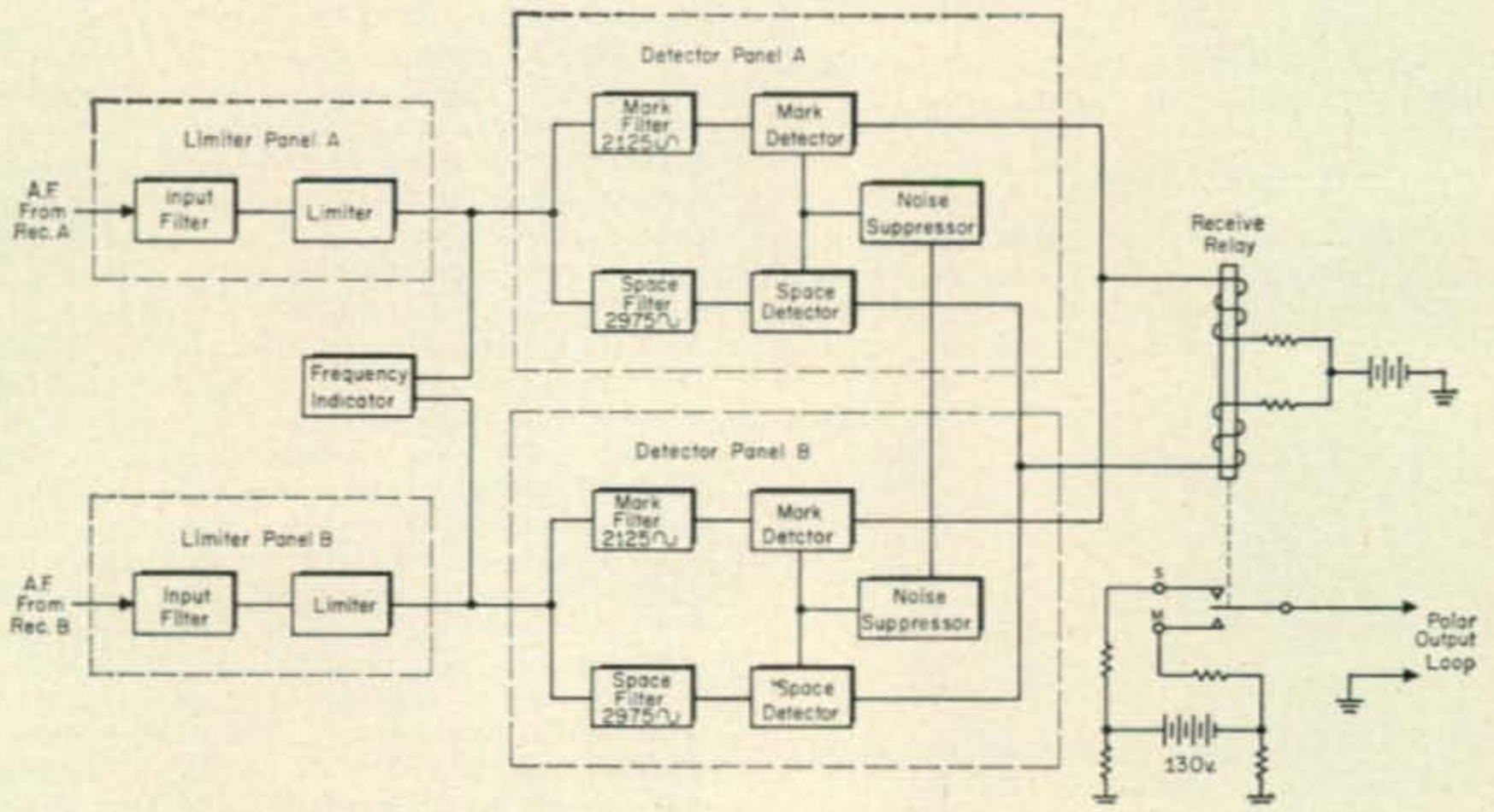


Fig.—Block diagram of the AN/FGC-1 dual diversity terminal unit.

The Model 660A Teleprinter-to-Morse Code Converter to be used to transmit Official ARRL Bulletins on RTTY at W1AW

few RTTYers use diversity because; first, the space for separate antennas is not available; and second, two receivers suitable for diversity operation are not available. Actually, there *are* a few RTTYers who *do* use dual-diversity by using one antenna horizontal and the other vertical, and identical receivers with their h.f. and beat frequency oscillators coupled together just enough to lock, and combining simply in the audio circuit or better yet by combining in the TU, if one of the surplus units such as the AN/FGC-1 is used.

Basically, the AN/FGC-1 is an audio-type of TU of the filter type, using the standard tones of 2125-cycles for *mark* and 2975-cycles for *space*. The block diagram is shown in fig. 1. Band-pass filters are used at each input, and the output is a *polar* telegraph loop circuit, obtained by the use of a polar relay. The reason for this output is that, in the customary fixed-station installation, the TU is located many miles from the Signal Center where the Teletype equipment is located. Considerable telegraph distortion would result if the usual neutral loop were used, therefore the polar circuit. Polar relays were no problem in military installations as the I-193 Polar Relay Test Set was always supplied. By the way, absolutely *no* hash is radiated by the polar relay in *this* TU.

The AN/FGC-1 has several disadvantages, besides its weight and size. The polar output circuit might be considered one. Another is the fact that it is set up for 850-cycle shift, only. (It is broad enough, however, that shifts down to about 300-cycles can be copied by straddle-tuning.) The biggest disadvantage is that the operator has no way to compensate for any telegraph bias in the signal being received. (This is bad for the casual RTTYer as many random contacts invariably have this difficiency.)

The AN/FGC-1 has several advantages, besides its diversity feature, to some RTTYers. Of course it is built most ruggedly and for continuous duty. (Many units come equipped with 25-cycle power supply which run much cooler on 60-cycles.) Some units come equipped with an a.f.c. panel, and when connected properly to a *vari-cap* in the receiver oscillator the desired beat notes can be kept within 15 cycles of the desired tones for long periods of time. Another advantage is that the AN/FGC-1 can be completely remotely controlled when installed in any convenient spot in the basement or in the garage. In typical telephone-company or Western Electric style, *everything* is fused, complete with alarm circuit that operates a buzzer when any fuse blows. An alarm circuit is also provided to ring a bell when the receiver drifts too far off frequency.

Naturally, we cannot cover as complex a unit as the AN/FGC-1 in just one easy RTTY Column, so we will try to discuss and illustrate each important panel or sub-unit in the following months. Stay tuned in, will you? (Best way is to *subscribe* to *CQ!*)

The New W1AW

Back in the October 1964 RTTY Column we pointed out that, "Separate tapes for RTTY and Morse *can* be made at the same time, by the same operator. There is equipment available to do this." We are **most** happy to learn, from the *ARRL Annual Report*, pages 6 and 7, that the *New* W1AW will have the special equipment to accomplish the same purpose. The equipment is the Model 660A Teleprinter-to-Morse converter, ". . . to be donated by W3NIO of Frederick Electronics . . . This will make it possible to make one tape-punching serve both c.w. and *future* RTTY requirements." (The italics are ours.)

The 660A, shown in the picture, is a completely solid-state device that provides a direct conversion from the standard five-level Baudot code to International Morse Code. Output speed is continuously adjustable from 10 to 30 w.p.m. when used with the Model 14 TD of the Model 19 at W1AW. A keyed sidetone output permits audio monitoring of the Morse code as it comes out of the unit. While the procedure probably will be to punch out Bulletin tapes on the keyboard of the Model 19, later sending them via the TD and the 660A, direct Morse transmission from the Model 19 keyboard is also possible. The important thing is that, as we said back in October, no increase in manpower is necessary.

On the Bauds

W1GKJ of Old Orchard Beach, Maine, works 20. K1USD of Middletown, R.I., is on 80 with a Model 14 strip printer. W2JHY of Middletown, N.J., is on 80 with a 500-watt linear driven by a 20A. W2MXN of Rochester, N.Y., uses a 32S-1 and a 75S-1 with a Model 15 and a CV-89A TU. K2YXB of Poughkeepsie, N.Y., is Acting Net Control of the East Coast RTTY Net (ECF1) which meets Wednesday nights at

[*Continued on page 108*]

YL

LOUISA B. SANDO,* W5RZJ

ONCE again we offer congratulations to the winners in YLRL's YL/OM Contest, the 1965 one being the 16th annual affair. And special congrats to WA6OAT, Jessie, who moved up to first place on phone and held second on c.w., after placing second on both phone and c.w. in the 1964 contest. W3CUL held onto first place again on c.w. And to KØSLD, Layne, congrats for placing first among the OMs on both phone and c.w. Only five logs were received for VHF, all from YLs, with K1ICQ, Mary, having a high of 127.5 points.

V.P. WØHJL, who checked the logs, said comments from the OMs ran from "The YLs are wonderful operators," to "*Where* are all the YLs?"

We do not have space to list all of the scores as reported to Kayla, but here are the top scores in each category and the high scores for each district or country.

Disaster Traffic

Within hours after Lt. H. R. Hiner, USAF, W4HMK, told those attending the Dayton Hamvention banquet that amateur radio's future existence depended on "public service," the majority of those same amateurs were deeply involved in handling emergency communications following the April 11th tornadoes which wrought disaster throughout much of the Midwest. Though we have no complete list of those participating, these YLs were mentioned especially in April *Buckye Burr*, newsletter of the Buckeye Belles: K8MZT, Shirley, NC of the Red Cross Mutual Aid Net; W8HWX, K8VBO, K8TVX, WA8FSX, WA8CCD, WA8GPO, K8MQB, W8CJP, and K9IVG with the Indiana Phone Net, of which Roberta is net manager.

Congratulations to these, and to all amateur operators who gave dedicated service when it was so desperately needed. This is *public service* in the highest degree.

YLCC Custodian

From YLRL V.P. WØHJL we hear that as of Sept. 1, 1965 the new custodian for YLCC award will be Onie Woodward, W1ZEN, 14 Emmett St., Marlboro, Mass. Sincere gratitude from all to W4SGD, Katherine, for her FB handling of this demanding job for nearly ten years. Kayla says please *do not mail QSLs for YLCC to Katherine after August 1, 1965*. Mail them to Onie, and be patient until she receives the YLCC material from W4SGD and can get the certificates processed.

DJ2YL

As reported earlier, number 21 among the YLs to achieve WAZ was DJ2YL, Susi Liebig. Susi earned it on c.w.-phone, and lacks only one card to achieve WAZ on all phone. As of April she had 215 countries confirmed, and holds many other awards, among them AC 15 Z, DLD 200, DXCC, MMC, OHA, PC, R 6 K, S 6 S, WAC, WAC/YL, WAS, WASM, WFKAS, W 21 M, YLOM 10 CC, DUF, WAE, AAA.

Susi has been licensed since 1953. She uses a 250-watt homebrew transmitter (her OM DL6NB is her engineer) and a Drake 2 B receiver. She has antennas for 10, 15, 20, 40 and 80, but works DX mostly on 15 phone. Other hobbies are flowers and animals and currently Susi is raising Chinchillas. (Any other hams breed Chinchillas? If so, Susi says she is looking for a "first class boy" for her "excellent little girls." Hi!)

Here and There

W7NJS shared with us a letter from Lorraine Burrows, YLRL adoptee of the Portland Roses. Lorraine comments since Northern Rhodesia gained its independence last October it has been called Republic of Zambia. Calls have been

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

Susi Liebig, DJ2YL, was the 21st YL to earn WAZ.

Ivy Smythe, VE3EZI, earned the top YL score on c.w. in VE land in the YL/OM Contest for 1965, 1964 and 1962.

The Six Meter Club of Chicago participated in the 18th annual VHF Sweepstakes held Jan. 8-10, 1965, and these YLs placed 1st, 2nd and 3rd in the club's participation. L. to r., K9FHM, Mildred (3rd); W9AFA, Eleanor (2nd), and K9ZWV, Val (1st). The awards were presented at the club's 4th annual banquet in March.

changed from VQ2 to 9J2 and Lorraine's is now 9J2LB and her OM's 9J2JB. They are located at Kitwe, where her OM is an engineer for a large copper mine. Lorraine adds that one trip to the bottom of the mine, 4,500 ft. down, was enough for her!

Congratulations to K8HDO, Karla Hambel, for being chosen "National Goodwill Worker of 1965." Karla, severely handicapped from birth, learned to walk at age 11, after being told she never would. She earned a B average in college and now is a personnel worker for Goodwill. Karla is custodian of the Ohio Worked All 88 Counties award.

Current officers of the Loaded Clothes Line YL Net: pres., KØEVG; V.P., WAØCSF; secy, W7GGV; treas., KØWZN; P/C, K7WVT. They have made some changes in the LCL certificate, and now offer a 5 off-net c.w. contact, 10 off-net c.w. contact, and a 15 phone contact award. Send all information to K5ECP for certificate.

New officers for Floridoras are: pres., K4UIZ; V.P., W4QBY; secy, K4ZXS; treas., K4TBG; P/C, WA4JBS; certificate custodian is K4RNS. G3IDG informs us of these additions to the U.K. YLs listed in *CQ* for Jan. '63 and Feb. '64:

G3IDG informs us of these additions to the and GW3TKT; while G3IYL is now GM3IYL, and G3RUA is now GW3RUA. At the time of writing Allan said this makes a total of 42 YLs licensed in the U.K.

RMD Convention

The Rocky Mountain Division convention, to be held at Centre Denver Motel July 17-18, will feature as main speaker Maj. Gen. Bestic of Defense Comman Communications. In addition to programs for all interests, there will be a YL Breakfast Sunday A.M. There also are plans for a YL/OM cocktail party Saturday before the banquet, with OMs eligible to attend if accompanied by a licensed YL. The Colorado YLs will have a hospitality room for relaxing. Sat. luncheon and Sun. bus trip to Air Force Academy for YFs. First prize will be a Swan 350 with a.c. and d.c. power supplies and complete set of Hustler antennas. Second prize will be a linear amplifier. Registration $3 before July 1, $4 thereafter. Send to DRC Conv. Committee, P.O. Box 6140, Denver, Colo. 80206. 33—*W5RZJ*

16th YL/OM Contest Results

YL PHONE

	Contacts	*Section*	*Score*
WA6OET, Jessie Billon	875	85	74,375
WAØEXX, Betty Lindsay	850	75	63,750
WB6CGA, Evelyn Kinder	533	75	39,975

OM PHONE

KØSLD, Layne LaBaume	79	38	3,752.5 *
W9WGO, Kenneth Bauer	59	35	2,581.25*
W5NQR, Bill Allen	56	32	2,240 *

YL CW

W3CUL, Mae Burke	458	84	48,090.5 *
WA6OET, Jessie Billon	500	72	45,000 *
W1YYM, Ellen White	492	89	43,788

OM CW

KØSLD, Layne LaBaume	93	45	5,231.25*
W5WZQ, David R. Blaschke	83	46	4,772.5 *
K2EIU/5, Kenneth E. Keeler	80	47	4,700 *

Top District and Country Scores

YL PHONE

K1LCI	13,581.25*
W2OWL	1,725 *
K3TNL	30,957.5 *
WA4FEY	21,228.75*
WA5KEC	6,000 *
WA6OET	74,375
K7KSF	23,562
K8ONV	31,837
K9TRP	20,764
WAØEXX	63,750
ZL2JO	9,990 *
VK3KS	470 *

OM PHONE

W1BAB	1,110 *
W2COB	255 *
W3BVL	1,350
K4JIG	1,522.5 *
W5NQR	2,240 *
WA6TKQ	1,080 *
W7ULC	840
W8WUO	1,612
W9WGO	2,581.25*
KØSLD	3,752.5 *
VE6UP	110 *
VE7AKB	1,350 *
ZL1AGO	3.75*
4U1ITU	49

YL CW

W1YYM	43,788
WA2LOZ	17,327.5 *
W3CUL	48,090.5 *
WA4HOM	37,980 *
K5FXX	29,497.5 *
WA6OET	45,000 *
K7HSB	28,890 *
K8ONV	32,300
W9KSE	38,640 *
KØZSQ	25,756.25*
VE3EZI	41,625 *
VE6ABV	23,512.5 *
VE5DZ	490 *
DJ9SB	7,672
G3ORU	455 *
KG4CM	20
OH5RZ	128
PY2SO	2,244
SP6AZY	2,250 *
VK3KS	3,838.75*
VP9FV	480 *
UW3XZ	2,328.75*

OM CW

W1HOZ	2,280
W2AAU	2,379
WØGKY/3	3,168.75*
K4TKM	2,745 *
W5WZQ	4,772.5 *
K6CJF	2,537.5 *
W7ULC	1,961
W8IBX	4,290 *
W9LNQ	3,750 *
KØSLD	5,231.25*
VE1AE	375 *
VE2AQO	2,720 *
VE3DXD	2,268.75*
VE4ZX	1,200
VE6UP	1,148
VE7BDJ	660
VE8NO	37.5 *
DL7BK	472.5 *
G3NFV	112.5 *
HP1AC	11.25*
IT1AGA	356.25*
JA2JW	36
LA9OI	7.5 *
PY2CQ	25
SP6FZ	169
XE2AAG	297.5 *
TF3AB	45 *

*Denotes low-power multiplier.

"He just *thinks* it's his rig . . ."

C.W. Results [*from page 60*]

European

UA3KAS	**229,362**	**631**	**58**	**170**
UA6KTB	**167,558**	**565**	**54**	**145**
UA4KKC	**157,320**	**613**	**50**	**140**
UA3KWA	134,166	478	48	129
UA1KBA	121,140	417	49	131
UA1KBB	111,867	545	40	107
UA3KZO	73,656	394	30	94
UA3KQB	69,864	324	41	82
UA3KAO	63,375	336	33	92
UA1KAG	36,540	368	19	65
UA3KYA	34,692	144	44	74
UA1KBR	31,324	395	17	47
UA6KAA	25,404	225	14	73
UA1KIA	25,025	139	25	66
UA6KAR	23,680	316	16	48
UA3KHA	22,015	165	24	61
UA6KAF	20,832	199	21	63
UA1KMF	16,058	139	21	41
UA1KUM	13,265	170	13	22
UA4KCE	12,864	198	12	36
UA3KRO	12,322	154	17	44
UA4KNA	11,844	127	19	44
UA6KEQ	7,874	100	18	44
UA3KOJ	3,441	91	8	23
UA1KDY	308	20	4	10

Kaliningrad

UA2KAW	**49,248**	**272**	**29**	**85**
UA2KAP	5,822	93	12	29
UA2KBD	3,456	60	8	16

Latvia

UQ2KCT	**72,716**	**461**	**27**	**71**
UQ2KAX	61,375	341	35	90
UQ2KAY	32,968	205	24	80
UQ2KBC	23,650	135	27	59
UQ2KAA	16,792	272	13	44

Lithuania

UP2KCF	**186,180**	**694**	**48**	**126**
UP2KBC	151,120	494	51	134
UP2KBA	13,504	143	20	44

Moldavia

UO5KAA	**14,500**	**210**	**15**	**44**

Ukraine

UB5KIX	**280,720**	**704**	**65**	**167**
UB5KAI	180,919	388	68	159
UB5KED	175,743	505	57	150
UB5KFF	130,139	450	49	132
UT5KKG	88,796	383	45	113
UB5KAS	74,448	300	40	104
UB5KBR	51,500	377	27	76
UB5KUH	15,552	199	14	50
UB5KEP	2,821	59	8	23

White Russia

UC2KAA	**29,039**	**268**	**12**	**59**

Oceania

Australia

VK5ZP **914,742 1188 91 176**
(VK5ZP & VK5NO)

South America

Venezuela

YV9AA **1,046,025 1617 73 152**
(YV5AEC, 5AGD, 5ANT, 5BOA, 5BKA, 5GO)

MULTI-OPERATOR

Multi-Transmitter

North America

K2GL **1,826,046 1457 119 324**
(K2GL, 2DGT, 2TXC, 2UYG, W1GYE, 2GLM, 2IWC, 6KFV, WB2MFX)

W3MSK **1,508,700 1248 113 315**
(W3MSK, 3EIS, 3FYS, 3TMZ, 3ZKH, 6HOH, K1ANV, CN8FW)

W4KXV **1,040,348 1026 102 256**
(W4KXV, K2UFT, 3EST, 4MXF, 4VDL, WA4GHV, 4JFY, 4LNV)

W3VKD 488,142 624 83 199
(W3VKD, 3AOH, 3LMM, 3UHN, K3DKD)

W4BCV 352,571 489 82 189
(W4BCV, 4CVI, 4MPV, 4WPI, K4FXN)

VP9BO **306,192 1257 40 72**
(VP9BO, 9BY, 9WB, W5HWR, WB2PXZ)

KZ5AF **190,750 601 46 79**
(KZ5AF & W5FNB)

Africa

ET3USA **330,864 635 56 127**
(K1QHP/FL8AK, WB2OGA, W3JFP, K4YFE)

Europe

DJ3JZ **936,936 1425 84 224**
(DJ3JZ, 1BZ, 4LI, 7AF, DL1CR, 3AO, 6KC, 9CI)

DM7L **694,070 1569 78 203**
(DM2ATL, 3BL, 3EL, 3ML, 4CL, 4PL)

SM5CZQ **682,962 1265 87 207**
(SM5CZQ, RC, ARR, BLA, BOU, BPJ, BDY)

UB5KBA **462,735 1401 83 195**
(UB5AC, 5BB, 5WF, 5WJ, UY5MG)

OH2AA **447,447 1006 73 200**
(OH2BH, BT, ER, FS, KK, LP, LX, MK, SB, WI, BBM)

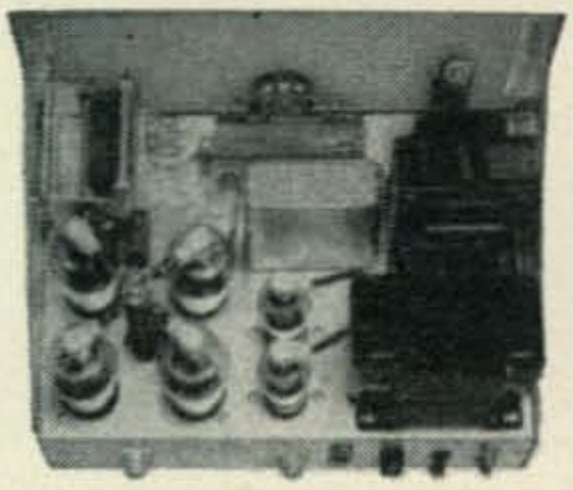
OH1AA 405,072 973 69 192
(Club Station)

SM5BGK 121,849 550 45 124
(SM5BGK & SM5DKH)

SL7ZJ 29,211 218 27 64
(SM7BEX & SM7DMN)

Our thanks to the following stations who submitted check logs: DM3HO, DM3XFN, F2SQ, K9VYT, KL7AUV, LA1SH/mm, OH2BDS, OK1AAE, OK1AGV, OK1AJY, OK1AWJ, OK1CEJ, OK1CIJ, OK1CZ, OK1NK, OK1PT, OK1US, OK1KDT, OK1KHK, OK2BCJ, OK2BCN, OK2BEF, OK2BEV, OK2BGH, OK2KEZ, OK2KNZ, OK2KSU, OK3CAO, OK3CFP, OK3QF, OK3QQ, OK3TV, OK3KAS, OK3KAL, OK3KLM, OZ7KV, SM3CJD, SM5DQG, SM6ALA, SM6JY, SM7AVD, SM7BGA, SM7MS, SM7TV, UA4-20006, UQ2KCT, UV3MG, UV9UO, UW3AX, UW3EQ, UW3MX, K2OJD, W2GT, W2JB, W2PEO, W4RLS, WA4QPV, YO5-195, YO9HT, ZK1AR.

YOU CAN'T BEAT THIS KIT FOR VALUE!



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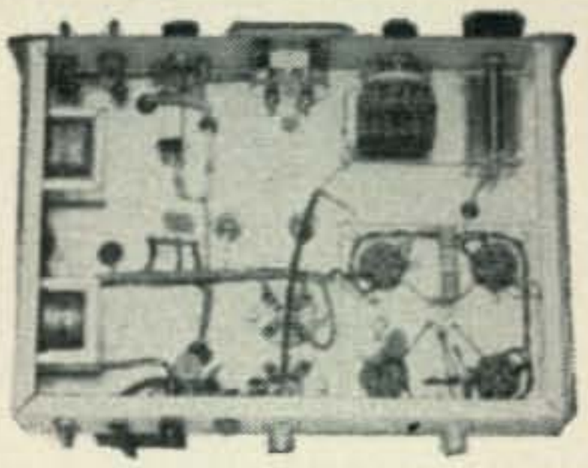


IT'S EASY TO ASSEMBLE AND WIRE — QUALITY THRU AND THRU

The P&H LA-400-C is not an ordinary kit, because a lot of the assembly has already been done for you. The plate transformer, filter choke, plate tuning capacitor etc. are mounted. Plate coil and band switch are assembled and mounted. Output loading capacitor network is assembled; in fact — about all you have to do is mount small parts, mount sockets and finish the wiring. As for performance — just ask anyone who uses an LA-400-C. Just compare his signal with the so-called "talking kilowatts" — it will be mighty hard to tell 3 DB difference. The difference in cost will pay for a good scope, plus a top notch receiver. One other point — Where else can you get a warranty such as P&H gives you on the LA-400-C ?

The 80 thru 10 meter band-switching pi network is designed for 800 watts PEP SSB, 400 watts CW, FM or FSK and 230 watts Linear AM (controlled carrier) or 185 watts (constant carrier) with 50-70 ohm output. Popular 100 watt SSB exciters require no swamping or matching networks to drive the low Z untuned input. Grounded grid circuit uses four 1625's or 837's on customers request. Meter reads RF drive, plate current, RF amps output. New modern compact 9" X 15" X 10½" gray cabinet also contains power supply using 816's. TVI suppressed, Parasitic Free.

LA-400-C Wired & Tested $219.95
Slightly higher West of Rockies.

ONE YEAR WARRANTY ON ALL PARTS AND TUBES !

P&H ELECTRONICS INC.
424 Columbia • Lafayette, Ind.

For further information, check number 39, on page 110

Announcements [*from page 14*]

demonstrations, exhibits, prizes. For more information contact Larry Yates, WA4PMA, Chairman, Henderson Amateur Radio Club, Henderson, Kentucky. 42420.

Terre Haute, Indiana

The Wabash Valley ARA presents the annual v.h.f. picnic Sunday, July 25, all day, at Turkey Run State Park, about 40 miles north of Terre Haute, on U.S. 41 and Ind. 47. One dollar registration at the gate only. Full day's events scheduled. Contact R. F. Burns, Jr., K9WHE, 53 North Fawn Drive, Deerfield, Terre Haute, Indiana, for details.

Kelowa, British Columbia

The Orchard City Amateur Radio Club of Kelowna, B.C. will sponsor the 1965 Okanagan International Hamfest at the Dolly Varden Auto Court in Okanagan Falls, B.C. on July 31 and Aug. 1st. Motels, Trailer and Tenting space is available in the area. There will be a giant Ham Radio Auction, Transmitter Hunt, contests, games, entertainment for the young. This is an International Hamfest and all Hams are invited to attend. Registration starts at 1:00 P.M. Saturday, July 31. For further information contact Leo Rimmer, VE7BMB, Sec'y, 2130 Ethel St., Kelowna, B.C., Canada.

Belgium Mobile Radio Rally

The Belgium Mobile Radio Rally on Sept. 12, 1965 will be held about 15 miles S.E. of Brussels. Licenses to operate can be obtained by sending photostatic copy of own license, together with—Name, Address, Home Call Sign, No. of Car license plate, and date of your visit to Belgium. (License may be obtained for up to one month) To: M. Le Directeur General des Radio Communications de la R.T.T., 42 rue des Palais, Brussels, 3, Belgium. Entry for the Rally, costs— Belgian Francs 100 ($2.25) and should be sent to: M. Marcel Godon, 85, rue de L' Institut, Rixensart, Belgium, together with name, full address; call sign, name of operator, mode of operation—a.m., s.s.b. and whether on 3.5 mc or 144. Check with him about further information. The Rally will operate on 3.5 and 144 mc but operation for the rest of the period will be permitted on all normal amateur bands except 160 meters. Applications should be made before the 15th of August.

Golden, Colorado

From June 25th through mid August a canoe expedition down the MacKensie River in Central Canada is planned by G. Brannan WB6DLQ. The most northern point of operation will be the Arctic Sea. Operation is planned on the following frequencies with special QSL card for stations worked: 3.890 to 3.900 mc, 7.320 to 7.330 mc, 14.260 to 12.270 mc, 21.310 to 21.320 mc, 28.500 to 28.510 mc.

San Fernando Valley, California

The 9th Annual San Fernando Valley Radio Club Hamfest-Picnic will be held on July 11, 1965 at the Sunset Farms in Sylmra, California. Adult admission will be one dollar and children under twelve, seventy-five cents. Tickets, maps, and further information are available by writing: W6SD, Box 3151, Van Nuys, California.

Cornwallis, Nova Scotia

The Annapolis Basin Amateur Radio Club of H.M.C.S. Cornwallis, which is made up of service personnel and civilians from the area, is arranging to hold the Maritime Amateur Radio Convention at the Digby Pines Hotel in Digby, N.S. on the 4th and 5th of September, 1965. Write to D. Gillis, Chairman Publicity Committee, P.O. Box 152, H.M.C.S. Cornwallis, Cornwallis, NovaScotia.

Norfolk, New York

The North Country Radio Club will hold its annual picnic at the Norfolk Rod and Gun Club July 11, 1965. There will be prizes for hams and their ladies. Junk Auction and other entertainment. Registration fee a piece of junk or one dollar. No charge for the ladies and children. Write WA2HEC, Box 475, Norfolk, N.Y., for more information.

[*Continued on page 98*]

Waters Keyer [*from page 49*]

to go in step with the timing of the automatic dots and dashes, according to the overall speed. The spacing between characters is not automatically provided, so be careful not to run the letters together, a condition that produces such formations as CP for CAN, PD for AND, 6E for THE, etc. On the other hand, don't allow excessive spacing between letters, as this will cause your sending to sound stilted rather than smooth flowing. This may require a slight change in the paddle adjustments. Finally, don't be too anxious to up your sending speed, until you have mastered the art of sure-fire and clean-cut sending at slower speeds.

Performance

Little comment is necessary in respect to the performance of the Codax itself, since this is largely dependent on the operator's proficiency; nevertheless, a few points we'd like to mention are as follows:

The speed control calibrations apparently are not in w.p.m. and are best used as an arbitrary reference.

The r.f. envelope of a tone-keyed s.s.b. transmitter normally tend to have a small spike at the leading edge, depending on the s.s.b. filter characteristics. This can produce a key click, so it is recommended that the normal transmitter-keying circuits be used with the Codax, unless it has been established that tone keying on your particular rig does not introduce objectionable clicks.

One of our experiences using the reed relay was that we accidentally tried to switch too much power with it. The only noticeable damage was that the relay contacts stuck closed together, but fortunately it was possible to free them again by jarring the unit.

Break-in operation was as fast as possible to attain with the transmitter system used for the tests.

One thing you cannot do with the Codax is to send in Continental Morse Code, because there is no long dash for the letter *L* (this is the case with other normal automatic electronic keyers).

Operation of the keying paddles was comfortable after a bit of practice and after some readjustment of the gap and tensions. Even though it is said that you can't teach an old dog new tricks, we encountered no particular difficulties in learning to operate the Codax; in fact, the uniform and machine-like sending made possible using it made our keying by other accustomed means sound surprisingly inferior by comparison.

The unit is neatly styled in the customary Water's fashion. Size is 3¾" L. × 2¼" H. × 4¼" D. The paddle assembly extends 2" in front of the panel. Weight is 2 lbs.

The Waters Model 361 Codax Automatic Keyer is priced at $92.50, with connecting cables, but less batteries. It is produced by Waters Manufacturing, Inc., Wayland, Mass.—*W2AEF*

Space [*from page 71*]

of revolution is 11 hours, 48 minutes. The frequencies used by the MOLNIYA satellite have not as yet been announced.

July 14 Mars Date

July 14 is almost certain to go down in scientific history. This is the date upon which the American MARINER-4 Mars probe is expected to pass within 5,000 miles of the planet, and send photographs of its surface back to earth.

The Mars bound MARINER-4 spacecraft set a world space communication record on April 29, as it reached a straight-line distance from the earth of *66 million miles*. The previous space DX record was held by the Russian MARS-1 space probe which maintained radio contact with the earth for a distance of approximately 65 million miles during early 1963.

MARINER-4 continues to radio back engineering and scientific data 24-hours a day to ground stations in California, Australia and South Africa. A 10-watt transmitter aboard the probe operates on 2295 mc. Since breaking the DX record on April 29, MARINER-4 continues on course to Mars at the rate of almost 1,000,000 miles a day. It is expected to pass within approximately 5,000 miles of Mars on July 14, after traveling a distance of 134 million miles from earth.

As MARINER-4 passes Mars, a single television camera viewing the planet through a reflecting telescope aboard the spacecraft, will take as many as 22 black and white photographs of the Martian surface. The pictures will be taken in a matter of a few seconds and stored on tape within the satellite. After the satellite has passed Mars, the pictures, on command, will be transmitted slowly in digital form and re-assembled at the ground station. Each photo will take a little longer than 8 hours to relay to earth. The first picture will be taken when MARINER-4 is about 8,400 miles from Mars. At this distance the television camera will sweep about 4,000 miles of the planet's surface. The spacecraft will be about 6,000 miles from Mars for the final picture. At this distance, objects as small as two miles across will be seen on the surface of Mars.

While it will not be possible for space-listeners to receive signals directly from MARINER-4, arrangements have been made to flash the pictures on the national television networks as soon as they have been re-assembled and studied at the ground stations. The pictures are expected to disclose more about the planet Mars than has ever been known previously.

73, George, W3ASK

RTTY from A-Z [*from page 46*]

distortion measuring instruments are made and sold separate and apart from the Bell System. The price of these instruments is such that it places them out of the realm of practicality for most radio amateurs.

Later on in this series a number of distortion measuring devices as well as a distortion generating device will be covered. Actual measurements of distortion, as well as the design and construction of a simple device that is quite helpful in making RTTY distortion checks and measurements, will also be covered in due time.

[*To be continued*]

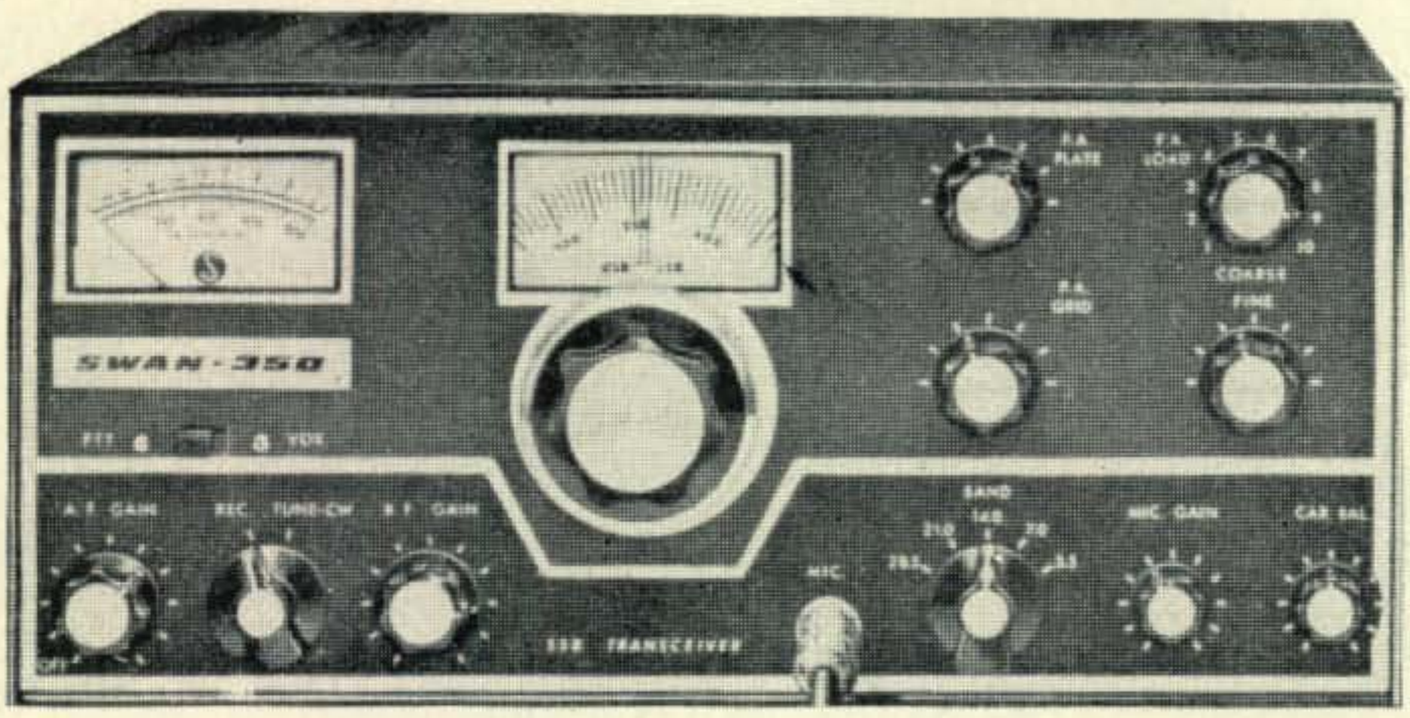
Corrections

In the process of turning out a technical article every month, one learns to appreciate the problems of the editorial staff of a technical magazine such as *CQ*. Numerous steps are involved in the process of getting technical articles published with a minimum of errors. (I didn't say "no errors", but a minimum of errors.) Invariably, there is always the race of time between the various steps involved. There also seems to be the inevitable gremlin—the transposed letter or numeral—the line on a drawing either extended too far or else not far enough—galley proofs don't always make the round trip from the publisher to the author and back to the publisher in time to get corrections made before going to press. At times this has been due to publishing delays or the author being away from Dallas. One time, for reasons known only to the hotel at which the author was staying in Washington, the proofs were never delivered during the week that the author was there!

Despite the above, the errors in the RTTY series have been relatively few, and most have been pretty obvious. However, the corrections are listed below so that you may make the proper notations in your copies.

Part 1, August, 1964, page 94, 14th line up from bottom: 154/22 = 7.0 instead of 154/22 = 7.5.
Part 2, September, 1964, page 49, 1st column, 5th line down: 3rd word should have been *on* instead of *as*.
Part 3, October, 1964, page 49, 2nd column, 8th line down: should read fig. 5 instead of 8.
Same paragraph, last line: Next to last word should be *fiber* instead of fiberglass.
Part 5, December, 1964, page 35, fig. 31 (a): Capacitor across RFC_1 should be designated as C_2.
Page 36, Fig. 33 (A) and (B); The r.f.c. in each circuit from cathode direct to ground should be designated as RFC_1 and the other as RFC_2.
Page 37, Fig. 35; b.f.o. f_2 at bottom of curve should be designated as 455.5 instead of 455.25.
Page 38, 23rd line: Fig. 37A should read Fig. 37.
Part 7, February, 1965, page 57, Fig. 45; Call letters in title should be W2JAV instead of W2AJV.
Page 58, Fig. 46: Call letters in title should be W2JAV instead of W2AJV. The short strap (about ¼"), right above the word *work* in the title should be removed. The mid-point of strap connecting the two 0.05 capacitors in grid and cathode circuit of *V*4A and *V*4B should have a dot indicating a connection and a strap to ground should also be put at this point.
Part 9, April, 1965, page 46: Add this sentence just before last line of 2nd paragraph. (At least the most popular ones used for amateur radio use, as covered here).
Page 47, Fig. 51: Terminal No. 6 should be designated with a minus sign and terminal No. 3 with a plus sign.
Fig. 53: Change word *Distributor* to read *Transmitter*.
Part 10, May, 1965, page 66, last paragraph of "Mechanical Adjustments", line 4: Change Fig. 51 to Fig. 54. Put a period between words *spool* and *If* of sentence that follows.
Page 92, 1st column, 3rd line up from bottom, 3rd word should be *not* instead of *no*.
Last paragraph: Change I-193-*A* to I-193-*C* in both references. ■

The Source For SWAN



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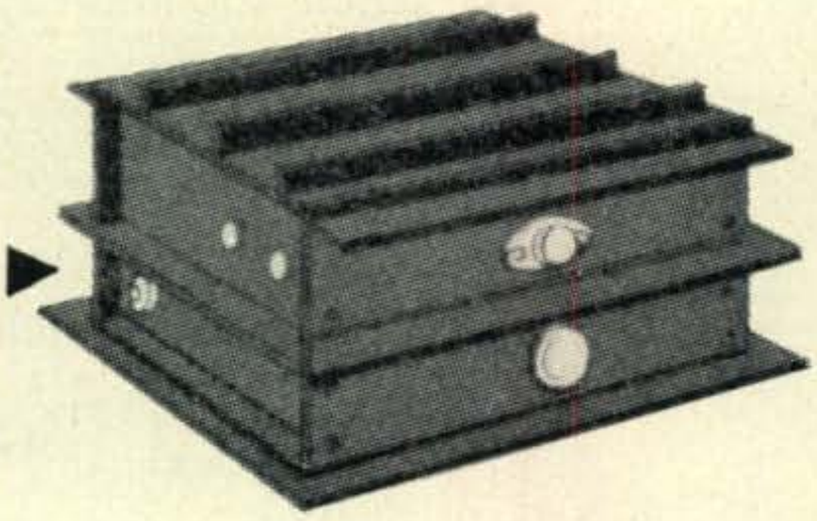

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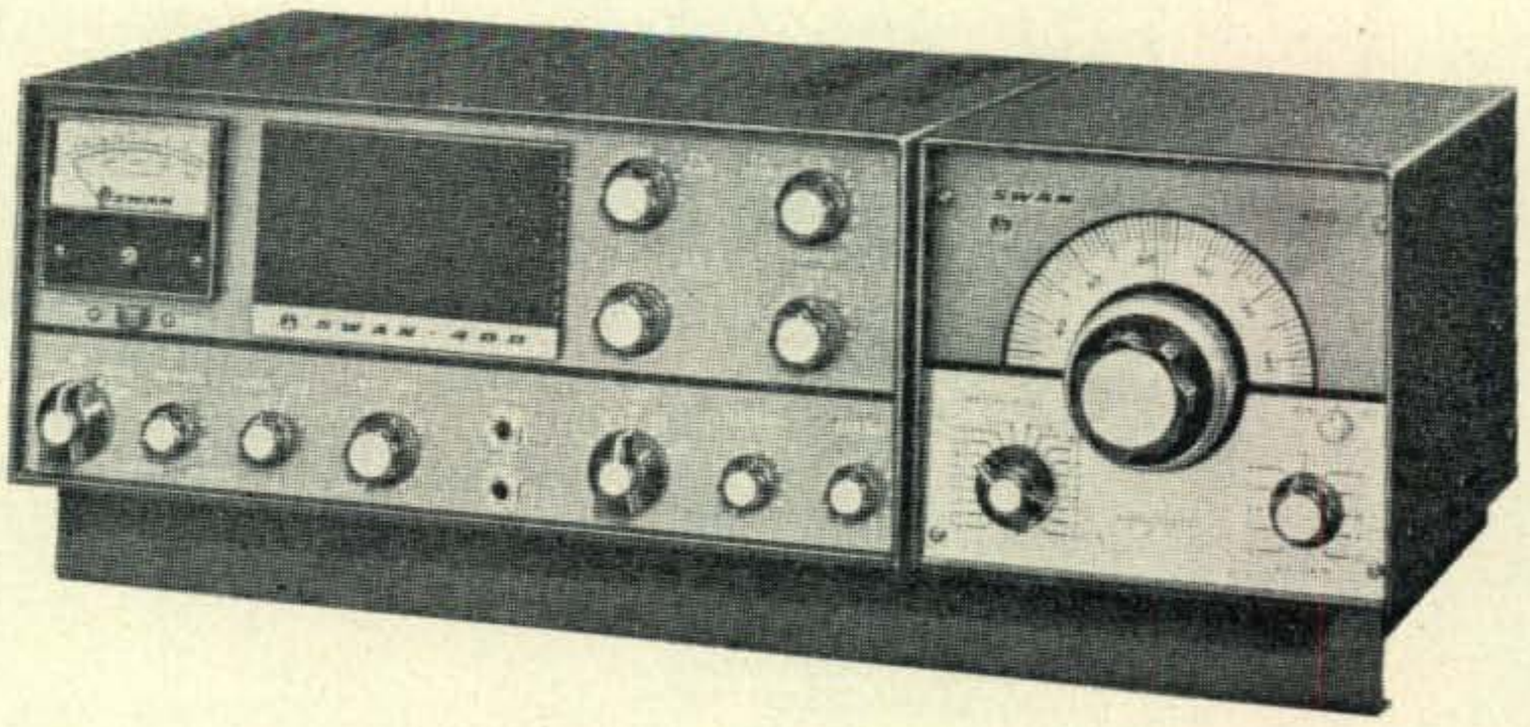

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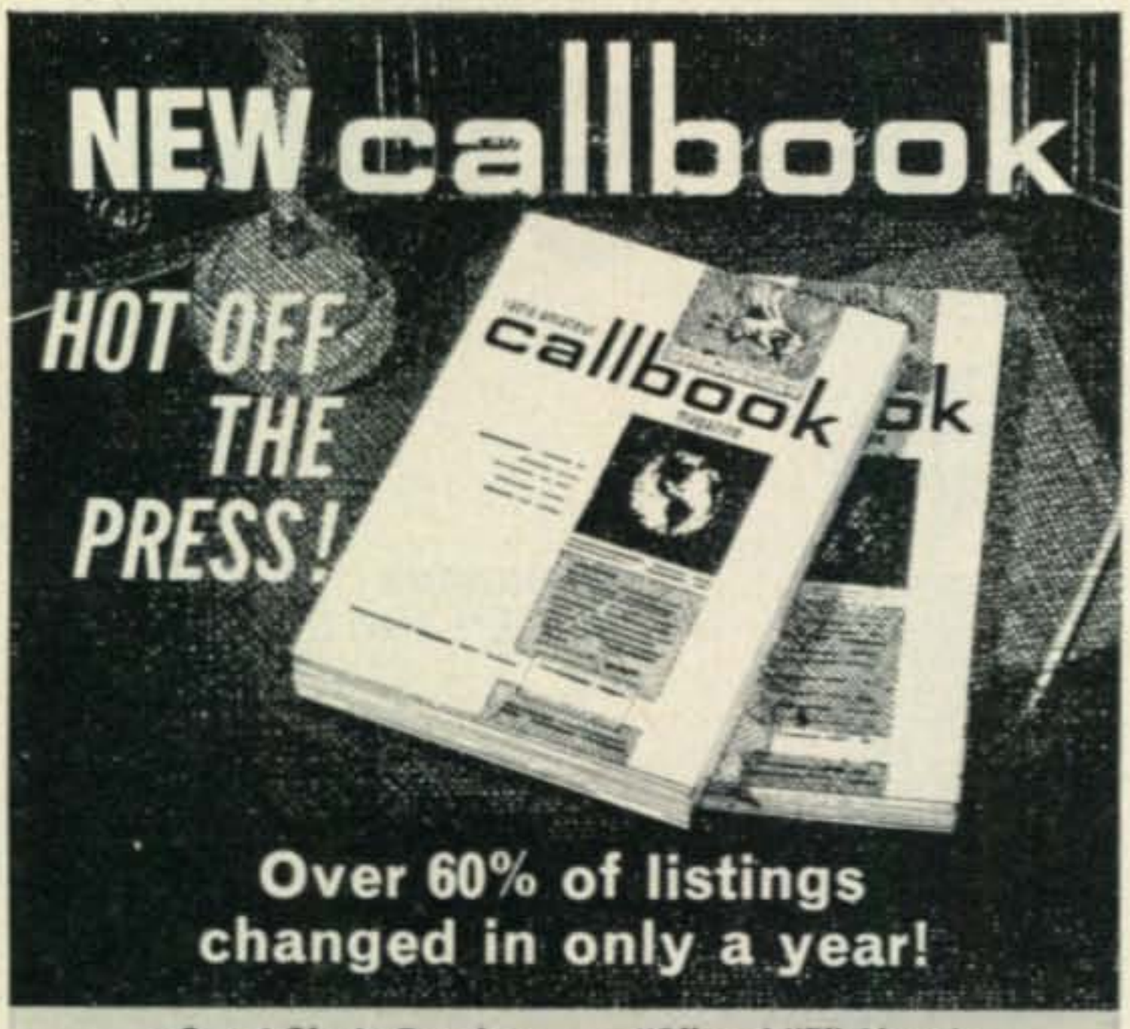

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Letters [*from page 12*]

The CPR Award

Editor, *CQ:*

Thank you very much for the publication of our article on the CPR Award in the March issue of your magazine. We have already had many applications for the award since then, as well as some suggestions how to improve the procedure.

We would be very glad if you could inform your readers in one of your subsequent issues of *CQ* that RTTY communications are also taken into account in the CPR evaluation. In order to indicate in the log that the communication was in RTTY, the letter "R" is to be mentioned in the "CW" column of the log instead of the habitual "X."

On the other hand, we have reconsidered the rule concerning the taking into account of QSO's confirmed only by QSL cards. While the value of such QSO's is naturally higher for statistical evaluation, it would nevertheless be useful to have information on established contacts, even if they were not confirmed by QSL, but only by the amateur's log. Therefore, these QSO's will also count for the CPR Award in the future. The symbol that the QSO was only confirmed by log should be indicated by the letter "L" in a supplementary column, on the right-hand side of the CPR stroke. The conditions to obtain different classes of CPR remain unchanged. The diploma will show the number of QSO's confirmed by QSL and by log.

Finally, we should like to draw your attention to the slight misspelling of the author's name, both in the table of contents (page 3) and the article (page 57). The correct spelling is Joachim (the last letter was given as N).

Thank you once again for the nice presentation of the article.

Dr. M. Joachim, OK1WI
President, IARC
Geneva 20, Switzerland

Selecting Coaxial Cable

Editor, *CQ:*

I must write to you immediately in gratitude for that excellent article in the May 1965 issue of *CQ* magazine, "How To Select a Coaxial Cable," by Charles Camillo, K1RBO/9. I was also one of the unsuspecting who thought that all new RG-8U cable was the same. Thank you very much!

I have one suggestion—with an article such as this, I would like to read a two- or three-sentence biographical note about the author. Top rate hams are often of professions not connected with electronics, and I am sure even some of them are sufficiently qualified in hamdom to write good articles which can benefit us all. How about a brief biographical sketch on the author of each major article?

Wes Miller, W5QNK
Baptist Theological Seminary
8803 Ruschlikon-Zh
Switzerland

Editor, *CQ:*

The article "How To Select Coaxial Cable" by Charles Camillo (May, 1965) was informative, but contains a statement which appears to be wrong. He says (page 34) "Most amateurs forget that a coaxial transmission line is always the equivalent of a rather large capacitor across the loading capacitor of the pi-network." If the pi-network is accurately matched to the coaxial line, the latter should present a purely resistive load, and cannot present the characteristics of "a rather large capacitor," which obviously would have a capacitive reactance.

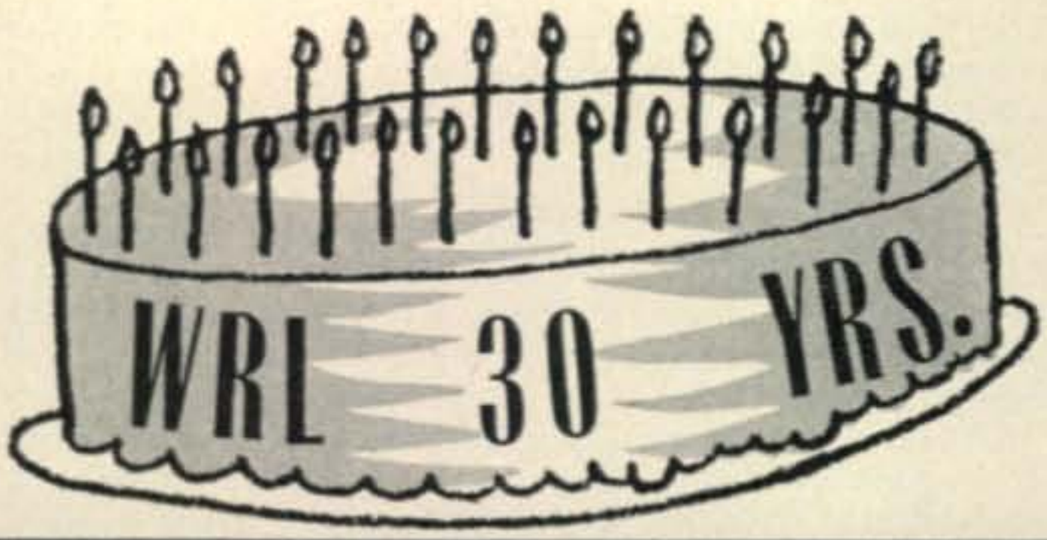
Hubert Woods
2346 Clover Lane
Northfield, Illinois

Random Notes on CHC

Editor, *CQ:*

I wish to present a plea for conscientious consideration of the recent outbreak of hostilities between the ex-CHC editor and the *CQ* management. It is extremely unfortunate that this hopefully temporary setback to the CHC program should occur at all. In view of the recent side-taking and subsequent dissolution of long friendships, a veritable civil war seems in the making.

I feel the West Coast end of the dispute is wrong in his obvious retaliation, and the party you represent will be *most* favorably looked upon if the whole business



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Letters [*from page 96*]

would be sttopped right here before sabotage of even grander scale is committed.

. . . Even though I firmly oppose his actions I cannot help but fear that further revenge might completely destroy both a fundamentally honorable man and the foundation this pioneer ham has laid.

Mike Slaughter, WA8JWD
1129 Bretton Dr.
Kalamazoo, Michigan 49007

Mike, the "hostilities" that have existed between K6BX and *CQ* have been rather one-sided as a quick check into back issues of both *CQ* and K6BX publications will reveal. I feel that *CQ* has acted in a rather restrained manner considering the extent of allegations and harassment by K6BX against *CQ*. Frequently, our own readers have become sufficiently aroused by the direction that affairs have taken to write to *CQ* expressing their feelings, much as you have. *CQ* has gladly published their lettters, and will continue to do so. However, we will not remain silent where matters of importance to amateur radio are concerned, (see March '65, *CQ*, p. 7).—*K2MGA*

Editor, *CQ*:

During the past few months I have come to the conclusion that being a member of the Certificate Hunter's Club carries about as much prestige as a 3rd class member of the Rag Chewers Club. Unfortunately, this is not due to slander by the ARRL, Pravda, or the local mosque, but by the childish propaganda generated by "our" own executive secretary, or whatever he calls himself.

Personally, I'm sick of reading the hate sheets he puts out which are blandly called newsletters. I think it's time for some responsible member of the CHC, with the time and facilities, to ask the membership to allow him to assume the position of secretary, and hence relieve the senile gentlemen of his duties before the CHC passes into oblivion!

Perhaps, it is still possible for some dedicated person to rebuild the CHC into the reputable organization it was in '63, but as it stands now, I'm ashamed to be a member. "QSP that far and wide."

Malcolm Keown, K4RIN
3111 Greenwich Avenue
Chattanooga, Tenn. 37415

Regarding the pleas by both K4RIN and WA8JWD to save the foundation and good reputation of CHC, we heartily concur. The Certificate Hunter's Club has done a marvelous job of promoting certificates and awards for better public relations, and under proper leadership, it can continue to do so. While it is not our place to *urge* the deposition of CHC's Executive Secretary, we feel that the interest of CHC and amateur radio in general might best be served by such a change, or at least a clarification of the relationship of K6BX's opinion to the opinion of CHC membership. CHC is much too valuabie a group to have to suffer under incapable leadership.—*K2MGA*

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Announcements [*from page 93*]

Oklahoma City, Oklahoma

The West Gulf Division ARRL Convention will be held Friday, Saturday, and Sunday, July 9, 10, and 11, at the Sheraton Hotel in Oklahoma City, Oklahoma. Requests for Convention tickets should be mailed to West Gulf ARRL Convention, Box 19085, Oklahoma City, Okla. 73119.

Prince Edward Island

Bill, K2HVN, plans to operate from Prince Edward Island, VE1, the last two weeks in August. He will operate on 3,575, 7.050, 14.050 and 21.050 and c.w. and a.m. on 3.795, 14.195 and 21.245—but mostly c.w. on 7.050.

Club Forum [*from page* 18]

Although the remarks in this months column are directed primarily to new clubs it might be said that many of the suggestions could very well be used by established clubs to build up the membership rolls.

One very important consideration for all clubs is to invite the newer amateurs into the fold. Too many of the new hams get started on the wrong foot. By showing them the proper path you'll be helping yourself by making life easier for you when you operate near them on the bands. 73, Al, WA2TAQ

Contest Results [*from page 54*]

That just about does it for this year, its been been a tough one. Contrary to my early prediction the returns exceeded those of last year and we finally broke the 2000 barrier, 2035 to be exact. (730 in the Phone contest and 1305 in this one.) The country total of 110 equalled that of last year's so I think we can still lay claim to being the TOP DX Contest in the world. And we're still pretty generous with our awards, 387 of them in this one.

The last paragraph must be reserved for all those who have made this contest possible. The Trophy donors whose generosity has given our contest that touch of "Class," the office staff at *CQ*, Marcia, Dick and Al who now know the meaning of the word Contest and the overworked committee, Andy Malashuk, W1GYE, Ben Lazarus, W2JB and yours truly. We have got to add more workers to this committee . . . any takers? 73 for now, Frank, W1WY

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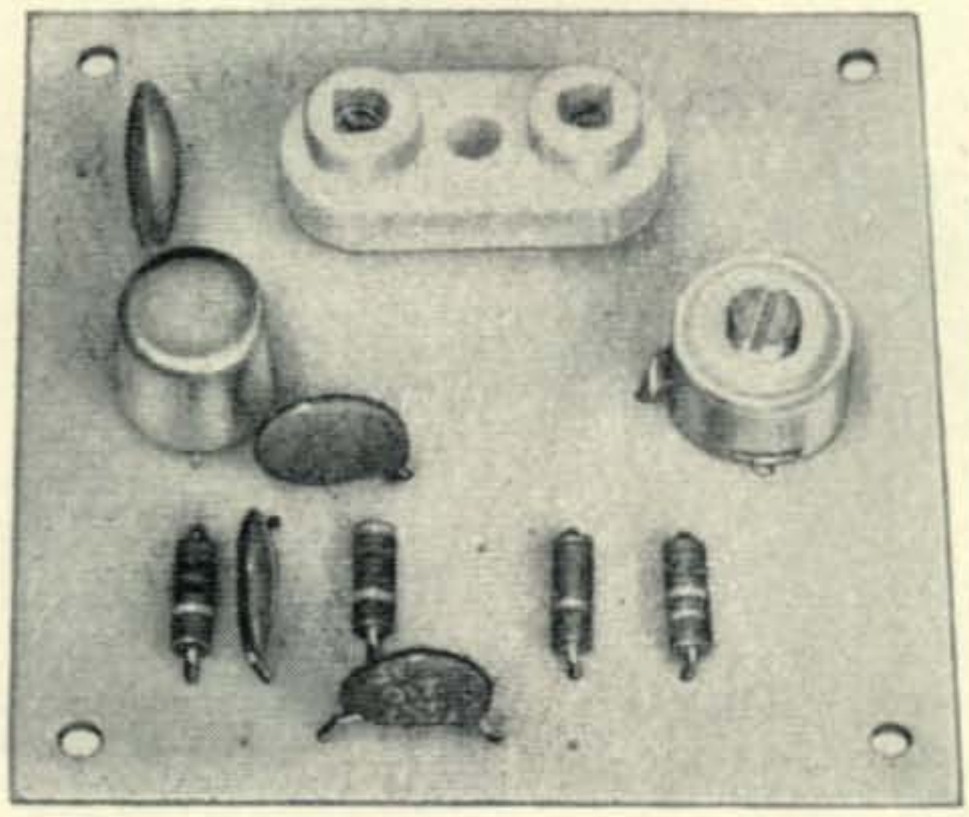

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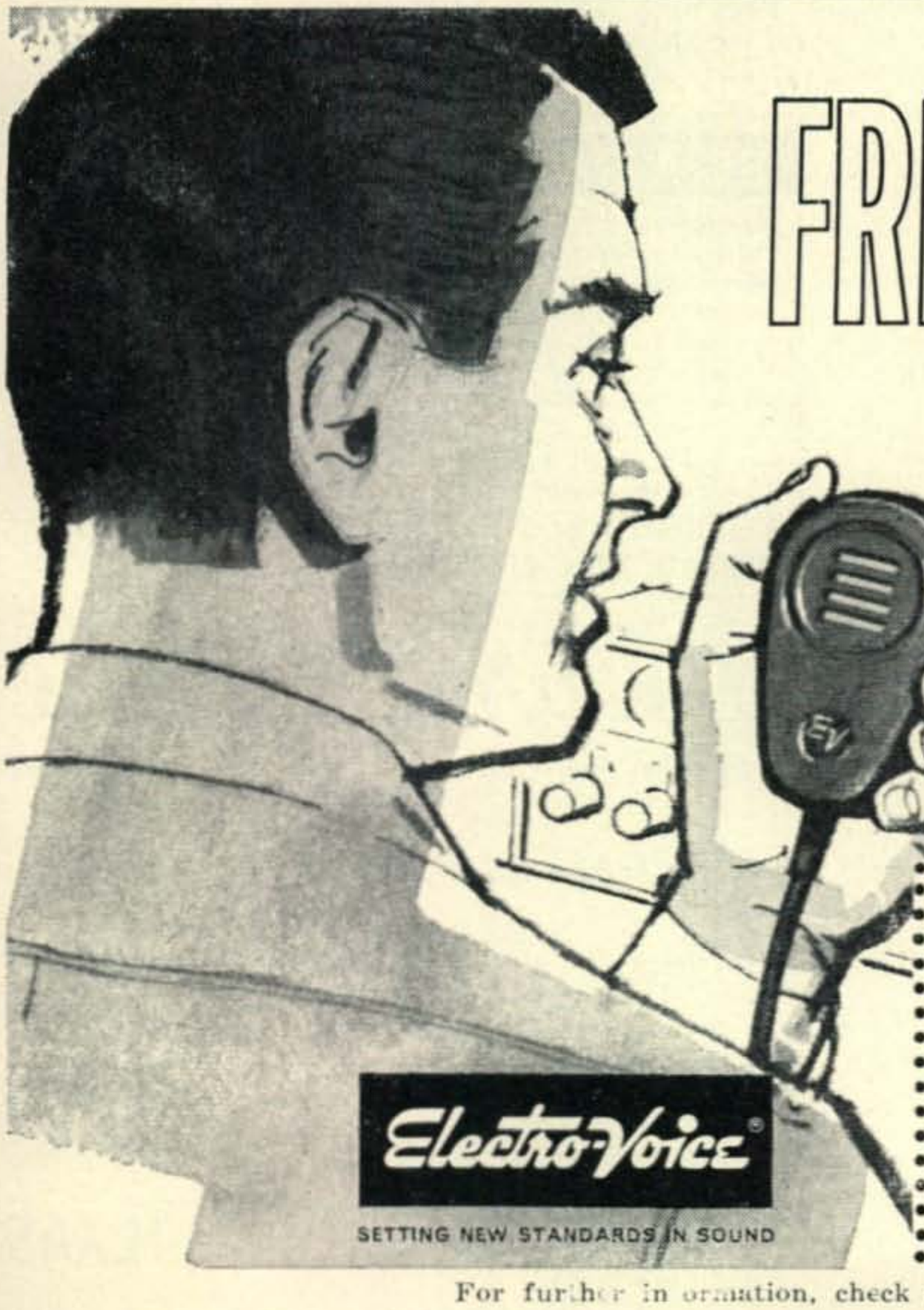

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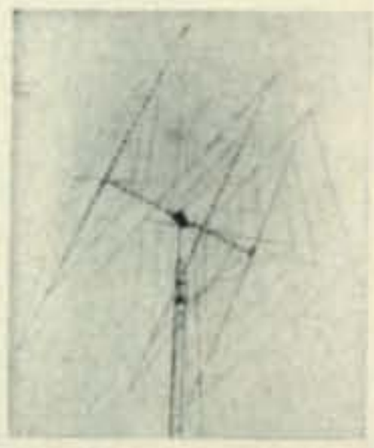

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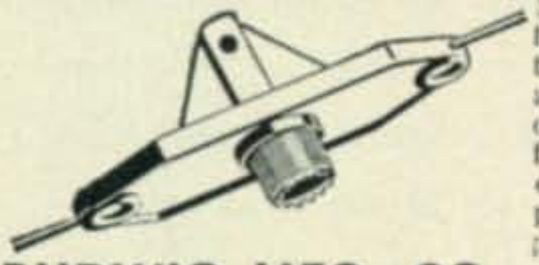

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How Do You React [*from page 38*]

apparently don't see eye-to-eye with the Commission on the proposed changes emphatically should tell it to FCC . . . not just to their buddies on the air! Undoubtedly *something* is going to come out of the 'throne room' in the way of changes; the proposal as it now stands will undoubtedly go through a number of modifications and/or changes before eventual adoption. What the final document will be is largely dependent upon the public reaction. *You*, in this case, *are* the public; it is squarely up to *you* to express yourself to the FCC. Remember the public voice has often swayed national and even international policies . . . you have a voice . . . *use* it!

And how do you do this, you say? The proposal plainly states that the FCC will *welcome* expressions and comments from interested parties; protests are of course included. They have set a dead-line of July 15th to receive such communications for consideration. When this little piece appears in print, there will be little time left so better you start preparing those *17* pages right now! Why '17' when the proposal calls for 'an original and *14* copies'? Make an extra copy for your Congressman and *send it to him;* by all means keep a copy as well for your files.

Certainly, if you are a dyed-in-the-wool ham with a sincere interest in your hobby, you should have *something* to tell the Commission . . . are you going to let a little typing chore stand in the way of contributing *your* voice in an effort to advance and upgrade your hobby with the least pain to all concerned? Not if you're *really* a ham! ■

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Contest Calendar [*from page 101*]

DARC WAE DX

C.W.—August 14-15 **Phone** September 11-12
Starts: 0000 GMT Saturday, Ends 2400 GMT Sunday in each instance.

The 11th annual WAE Contest sponsored by the DARC, with its unusual but by this time well known QTC feature which is now incorporated in both the c.w. and phone sections of the contest.

The object of the contest is for non-Europeans to work as many European stations as possible on all bands. (Note the WAE country list)

Rules: 1. Use all bands, 3.5 thru 28 mc.

2. The usual five and six digit serial numbers, RST or RS report plus a progressive three figure QSO number starting with 001.

3. Each exchange of serial numbers will count 1 point, except on 3.5 mc where it will count 2 points.

4. The same station may be contacted once on each band.

5. The multiplier for non-European stations is determined by the number of European countries worked on each band. (WAE list)

6. European stations will use the latest ARRL country list to figure their multiplier. In addition each call area in the following countries will also be considered a multiplier. JA, PY, VE/VO, VK, W/K, ZL & ZS. UA9 and UAØ also count separately.

7. The final score is the total QSO points, plus the QTC points if any, multiplied by the sum total of countries from all bands.

QTC Traffic: Additional point credit can be realized by taking advantage of the QTC traffic feature.

A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to a European station.

It can only be sent from a non-European station to a European station. The general idea being that after a number of European stations have been worked, a list of these stations can be reported back during a QSO with another station. An additional 1 point credit can be claimed for each station reported.

1. A QTC contains the time, call and QSO number of the station being reported. ie: 1200/DL1FF/123. This means that at 1200 GMT you worked DL1FF and received his number 123.

2. Only a maximum of 10 QTCs per station per band are permitted, although you may work the same station several times to complete this quota. Only the original contact with any one station has QSO point value however.

3. A QSO can be reported only once and not back to the originating station, even though the contact was made on another band.

4. Keep a uniform list of the QTCSs sent, ie: QTC 3/5, which would indicate that this is the 3rd series of QTCs sent and that 5 QSOs are being reported.

Classifications: 1. Scoring will be determined on all band operation only.

2. There are both single operator and multi-operator divisions.

3. There is also a power classification: Class A up to 50 watts, Class B up to 150 watts and Class C over 150 watts. It is therefore important that you indicate the power used.

Awards: Certificates will be awarded to the highest scorer in each classification in each country and country/district as indicated under #6 in the Rules. A minimum of at least 4 hours of operating is required to be eligible for an award.

2. Continental leaders will be additionally honored and 2nd and 3rd place certificates will be awarded in areas where sufficient participation warrants.

3. Contest contacts can be used for WAE certificate endorsement upon request, providing of course that the log of the requested station has also been received. These endorsements cannot be considered before the publication of the results of the contest and must be made on the regular WAE forms.

It is strongly recommended that you use the official DARC contest log form. A self-addressed envelope with 1 IRC (3 for Air Mail) will get you a supply from the DARC.

The address for your requests and your contest report is: Dr. H. G. Todt, DL7EN, Chlodwigstr. 5, 1 Berlin 42, Germany. Mailing deadline is September 15th for c.w. and October 15th for phone.

WAE Country List

CT 1 — CT 2 — DL/DJ/DM — EA — EA 6 — EI — F — FC — G — GC — GD — GI — GM — GM Shetland Islands — GW — HA — HB/4 U 1 ITU — HBØ/Liechtenstein — HV — I — IS — IT — LA — LA/Bear Island — LA/P Jan Mayen — LA/P Spitzbergen — LX — LZ — M 1 — OE — OH — OHØ — OK — ON — OY — OZ — PA — PX — SM — SP — SV — SV Rhodos — SV Crete — TA/European part — TF — UA/UW/UV 1 through 6 — UB/UT/UY — UC — UN — UO — UP — UQ — UR — UA Franz Josef Land — YO — YU — ZA — ZB 1 — ZB 2 — 3 A.

S.A.C. Contest

C.W.—September 18-19 **Phone**—September 25-26
Starts: 1500 GMT Saturday, Ends: 1800 GMT Sunday

This is the seventh Scandinavian Activity Contest and this year is being sponsored by the NRRL (Norway). Full coverage in next month's column.

Editors Note

Other contests that normally would appear in the Events List have been left out this month because no official word has been received at this time. The All Asia DX the last week-end in August, the Peruano, S.A.C. and MARC VE/W in September and still others in October. Past experience has proven that it is not wise to make an announcement unless I have received official notice.

73 for now, Frank, W1WY

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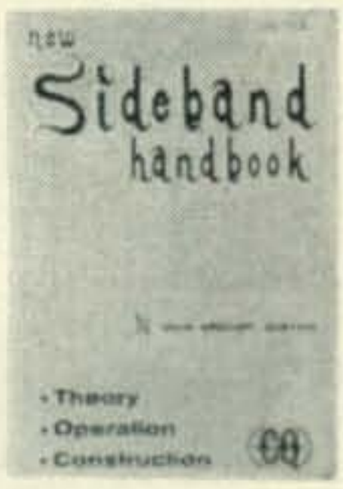

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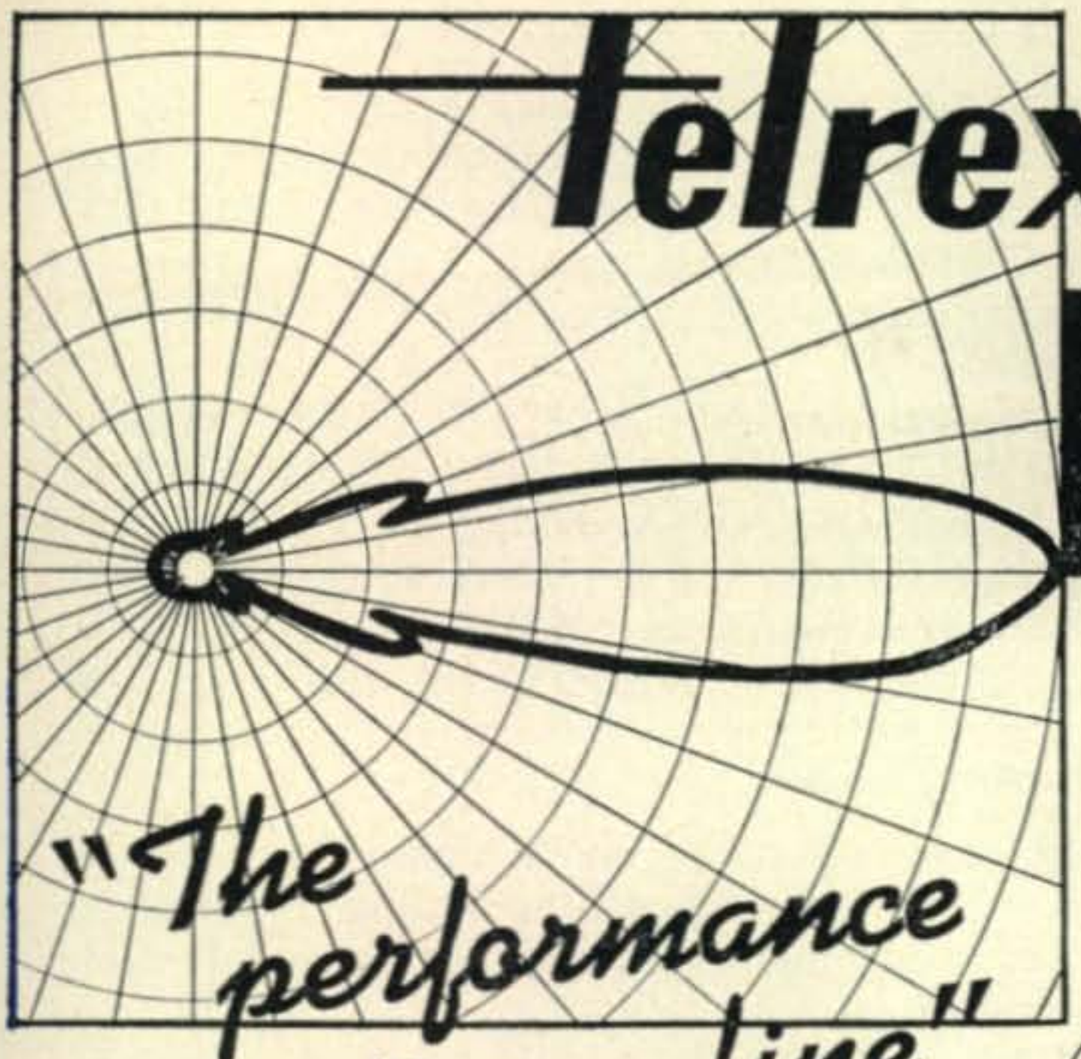

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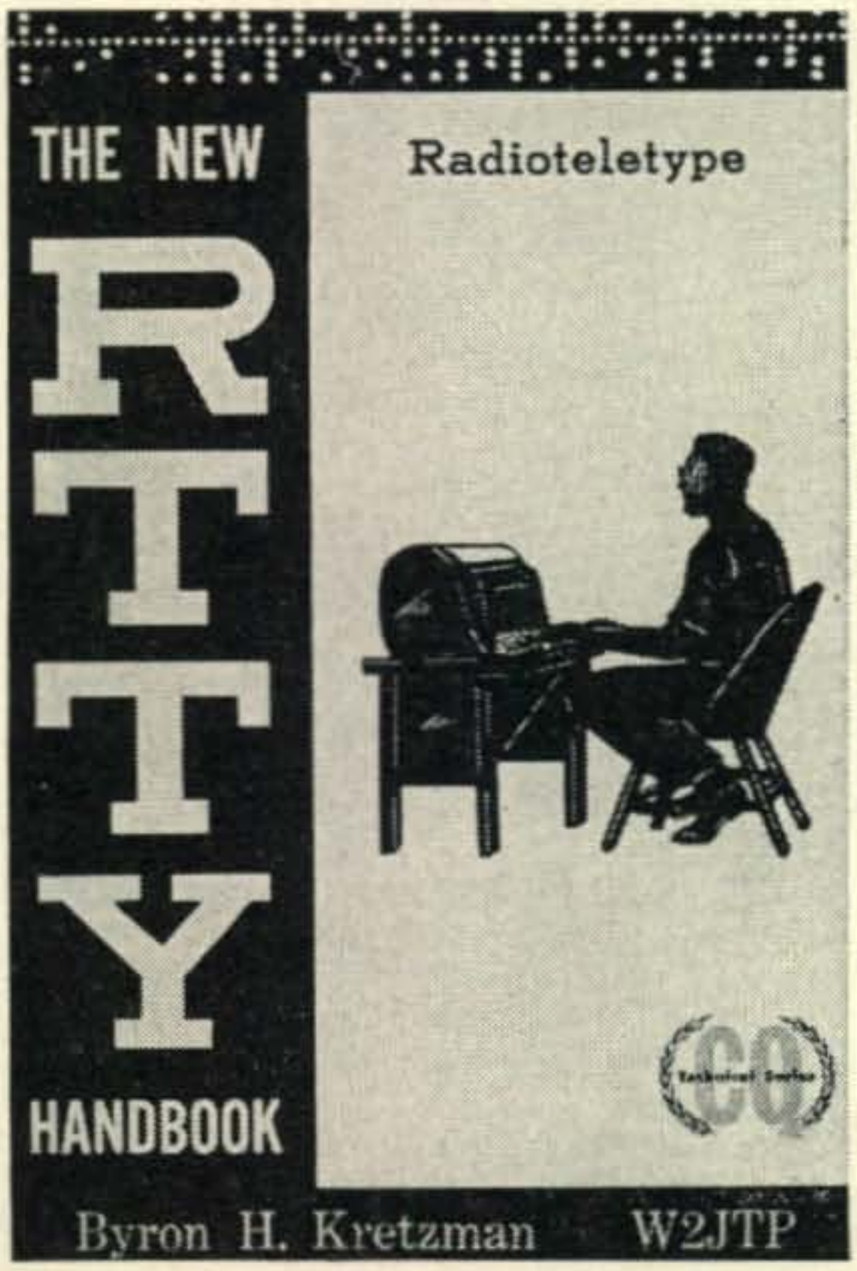

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"HI OSCAR" [*from page 41*]

on almost around the clock operation tracking each available pass. Sixteen contacts were made via the satellite, including a transcontinental QSO to California. S.w.l. reports came in from all over; from Paramus, New Jersey, to Fairbanks, Alaska!

Among those who took part in the construction and operation at WA2WEB are: W2QCR, SWI, K2AQG, GNA, HHS, HNY, IBF, KJI, LME, MHP, MPT, TTI, VNW, VPQ, WA2ANY, EKP, INB/KL7ELA, WB2COZ, DQS KPD, NCB, WN2MYV, NMF, OHH, and OMF. ■

Dummy Load [*from page 36*]

approximately 80%, much higher than was expected but this confirms the findings reported by other experimenters concerning coaxial cable operation at u.h.f.

The assembly makes an acceptable low reactance termination for 432 megacycle use. However, high power to conduct further tests is not yet available. It is doubted that the RG-58/U cable can be used for high power operation at 432 megacycles. A length of RG-8/U cable will probably prove adequate.

Conclusions

An assembly consisting of a low power reactive load and a suitable length of coaxial cable will make an acceptable low reactance termination at v.h.f. and u.h.f., for use as a dummy load with transmitters capable of high power output. Twin lead may also be used but it must not be wound in a coil or bunched up. Preferably, twin lead should be run from the transmitter in a straight line.

Tests of the cable-termination assembly need not be made. From the manufacturers specifications merely interpolate the length required for the desired attenuation. If in doubt use a long cable. A 500 foot length at 144 megacycles or a 200 foot length at 432 megacycles will tame any termination. ■

DX [*from page 68*]

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[*Continued on page 108*]

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ANTENNA tuning unit, brand new $3.00 postpaid (cost Navy $85.00). MDC, 923 W. Schiller, Phila. 40, Pa.

LEE'S OUTSTANDING NO-GUM OIL . . . Amazing space age lubricant. Cleans tuner and switch contacts, volume or contrast controls. Lubes record changers, tape recorders and motors, watches, camera shutter and iris controls, guns, locks, etc. Double order—2½ oz. $2.00 ppd. LEE'S PRODUCTS, Box 945, Arleta, California.

RTTY GEAR for sale. Write for list 88 or 44 mh Toroids. Five for $1.75 postpaid. Elliott Buchanan, W6VPC—1067 Mandana Blvd., Oakland, California 94610.

PICTORIAL STUDY in Amateur Radio Theory. Free Details. Dwight Cross, 1212 Lynch St., St. Louis, Mo. 63118.

ANTENNA, MULTI-BAND Doublet, 1 kw, s.w.r. less than 2:1, 80, 40 and 15 meters. Complete with insulators, 50 feet of coax and instructions. State Frequencys. $5.00. Adiabatic Enterprises, Box 151, Albany, California.

HONEYWELL W612B Transistorized Mobile Power Supplies in original cartons $20 each. Bob Beveridge WØUAN, 5104 39th Avenue South, Minneapolis, Minnesota 55417.

MOBILE Transistorized transmitter power supplies. Outputs from 400 to 600 volts, currents to 500 milliamperes. Ask for Technical Bulletin DE-C. Silentor Products, Box 298, Rolla, Missouri 65401.

POLAR RELAYS 255-A used, $2.25, Sockets Used $1.00, 88.D filters, used $1.50, D-164816 relays, unused $2.50. Experimenter Special—Set of 4 types polar relays solder terminals used $3.50 postpaid, USA. Limited Supply. Martin Brothers, 1420 So. 10½ St., Springfield, Illinois.

FAST, TANSISTOR RADIO Service, $4.00 complete. Free, Wholesale brochure. Twinlakes Electronics, Litchfield, Kentucky.

COLLINS 75A-4 OWNERS: Don't trade up! Investigate our conversion that makes the 75A-4 a real dream. W2VCZ—30 Pitcairn Ave., Ho-Ho-Kus, N.J. 201-652-8494.

PEORIA HAMFEST, September 19, Exposition Gardens, Peoria Area Amateur Radio Club, Advanced registration $1.00 until Sept. 11, Ferrel Lytle, W9DHE, 419 Stonegate Rd., Peoria, Illinois.

FREE CATALOG: Wholesale electronics, hundreds of items. Why pay more? ROYAL, Box 2691, El Cajon, California.

RTTY CHANNEL FILTERS, octal mounted, specify frequency, $3.00 each. Toroids. 88mh, uncased, 5 for $2.50. WA6JGI, 3232 Selby Avenue, Los Angeles, California 90034.

BOUND VOLUME 1964 **CQ** for sale. Order no wand be sure to receive your copy. Limited quantity. First come first served. Send $15.00 to Dept. H.W., **CQ** Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

FOR SALE—Gonset Communicator III 6 meters, 12v., complete with mike and book. Like new. Local sale only. $165.00 K2EEK, 75-15 177 St., Flushing 66, N.Y.

SAN FERNANDO VALLEY Radio Club, W6SD, 9th Annual Hamfest-Picnic, July 11. Sunset Farms, 16303 Foothill, San Fernando. Tremendous! Free prizes, swimming, contests. Write: WB6GZZ, c/o Box 3151, Van Nuys, Calif.

SPECIAL ANNOUNCEMENT Celebrate "Illinois Amateur Radio Week" with us by official proclamation of Governor Otto Kerner. The Hamfester Radio Club announces its 31st annual hamfest Sunday, August 8, 1965, at Santa Fe-Park 91st and Wolf Road—near Chicago. The hamfest features; manufacturer displays, mobile contest, swappers row, games for all ages, food, refreshments, a clown for the kids, and much more. For maps and details write: John Chass, K9LOK, 5434 South Bishop St., Chicago, Illinois 60609.

DARA AUCTION July 17 at 11:00 A.M., Island Park Dayton. Small Charge for consignments and trunk sales—Contact K8REG.

COMPLETE s.s.b.-a.m.-c.w. Station $450. Valiant 1, Viking SSB adaptor, HQ-180, good condition. K2AAS, 132-62 Pople Ave., Flushing, N.Y. 11355.

FOR SALE—B&W 5100B complete mike and book. Like new. $200.00. L. B. Huguenor, Jr., 1440 Sheridan Rd., Wilmette, Illinois.

FOR SALE: Variety of tubes (guaranteed) ⅓ Barry price, Rawson laboratory type multirange microammeter, ditto mullivoltmeter, transformers, chokes, experimental items. Send s.a.s.e. for list. William C. Reichard, Netcong, New Jersey 07857.

FOR SALE: 6 kvct xfmr, new and guaranteed to 1 amp; $25; RAX-1 receiver $20; RCA mobile power supply, new; homebrew a.m./c.w. 500 w 6 meter transmitter, make offer. Paul K3WFZ, Murrysville, Pennsylvania 15668-327-1675.

SX-111; used 25 hours; Best offer; James Cullen, 109 Thicket Road, Baltimore, Md.

KWM-2 Serial 994 clean with 516-F-2 ac power supply, D-104 mike, Heath AM-2 s.w.r. bridge. All $735. Robert Green, Rt. 4, Lazy Acres, Anderson, S.C.

Wanted: Complete set, preferably bound volumes, CQ for 1945 through 1963. Must be in excellent condition. Write Charles Miller, W4AXV, 2875th GEEIA Squadron, Box 460, APO San Francisco 96323.

I NEED and will pay top price for a GREBE receiver for my antique radio collection. Same also applies to PARAGON, CLAPP-EASTHAM, KENNEDY, MARCONI and similar material. J. Worcester, R.D. 1, Frankfort, N.Y.

FOR SALE—Collins 30L-1, Heath Kit Multiplier Q-F-1, Vibroplex Key and Microphone. Mrs. Alberta L. White, Box 1, Richland, Iowa 52585.

SIGNAL GENERATOR and hetrodyne type wavemeter combination, 1-222-A. Range 8-15 mc and 135-230 mc. Crystal calibrated. 115 v.a.c. $40.00. Also BC=1203-B signal generator modulator. $25.00. K8HOY, 833 Beaumont Road, Charleston, West Virginia.

WANTED, Frequency converters or plug-ins for 10 mc electronic counter. Any condition. W4EWC, 989 Echles, Memphis, Tennessee.

KWM-2 New, less accessories. DX-pedition fell through so selling for first good cash offer. K60QE, Phone 6335566, Orange, California.

SB-34, SB-22A, SB2-XC, SB2-VOX, SB1-MB and Hustler whips. $700 cash or will consider PC-62B or PC-6, or PC-2 DC or 22'er as partial payment. K2PGB, 46 Columbia Ave., Hopewell, N.J.

RTTY 255-A Polar relays $2.00, sockets for polar relays $2.00 plus postage. K5ZPY, Box 544 Hamilton, Texas 76531.

COLLINS 51J-2 factory converted to 51J-4 with 3.1 and 6 kc filters, Collins cabinet, and matching speaker, $650. Hammarlund SP-600 (military JX-26) for rack mounting $450. Both mint condition. H. Cervantes, 34 Johnson Rd., Binghamton, N.Y. 607-724-5785.

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Meet your fellow operators at the Rutledge Hotel, close to all direct connections to the Fair site, 5 minutes from Empire State Building, United Nations, New York Central Railroad, East Side Air Lines Terminal, and other areas of great interest in our city.

We offer a complete Ham Shack on the premises, featuring Equipment sponsored by Adelphi Electronics, Inc., so that you may not only talk to hams in the area but directly to the World's Fair site.

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Operating all bands incl. 2 & 6 meters. Group Rates Available. Reserve now.

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ROOM & BATH
DOUBLE
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For further information, check number 45, on page 110

OUR GOAL: TO HELP YOU BUILD A TV CAMERA!!!
(For less than $40)

Enjoy the fun of building your own LIVE TV camera. Most of the components can be found right in your own junkbox. We furnish only the hard-to-locate parts and easy-to-follow construction plans. INTERESTED?? If so, send 10¢ for more info.

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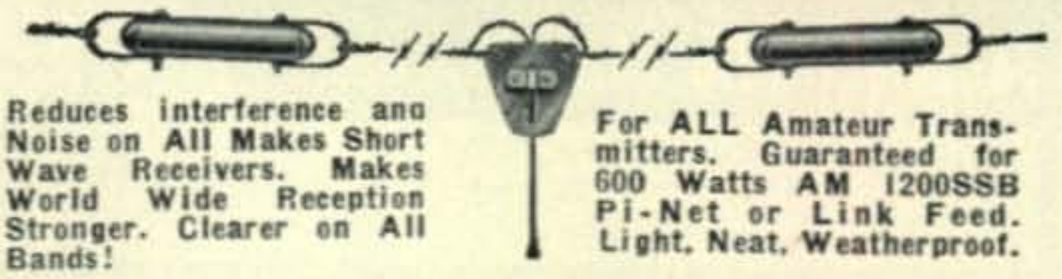
RTTY Equip. Sale on model 14, 15, 19, 26 & 28 teletypewriters. Trans-dist., sync. motors, (FRXD-3 reperforator—T.D. Combo.) TT63A/FGC teletypewriter-repeater-regenerator. Northern Radio dual freq. tone converter type 152, Northern Radio dual freq. tone keyer type 153, CU286/FRR-33 Coupler, etc. Send for free catalog to:

Atlantic Surplus Sales

250 Columbia Street Brooklyn, N.Y. 11231

ALL BAND TRAP ANTENNA !



Reduces interference and Noise on All Makes Short Wave Receivers. Makes World Wide Reception Stronger. Clearer on All Bands!

For ALL Amateur Transmitters. Guaranteed for 600 Watts AM 1200SSB Pi-Net or Link Feed. Light, Neat, Weatherproof.

Complete as shown total length 102 ft. with 96 ft. of 72ohmbalanced twinline. Hi-impact molded resonant traps. (Wt. 3 oz. 1" x 5" long). **You just tune to desired band** for beamlike results. Excellent for ALL world-wide short-wave receivers and amateur transmitters. For NOVICE AND ALL CLASS AMATEURS! NO EXTRA TUNERS OR GADGETS NEEDED! Eliminates 5 separate antennas with excellent performance guaranteed. **Inconspicuous for Fussy Neighborhoods!** NO HAYWIRE HOUSE APPEARANCE! EASY INSTALLATION! Complete Instructions.
75-40-20-15-10 meter bands. Complete **$15.95**
40-20-15-10 meter. 54-ft. (best for swl's). Complete **$14.95**

SEND ONLY $3.00 (cash, ck., mo) and pay postman balance COD plus postage on arrival or send full price for postpaid delivery. Free information on other all band antennas. 160-6 meters. etc. Available **only** from

WESTERN RADIO • Dept. AC-7 • Kearney, Nebraska

For further information, check number 47, on page 110

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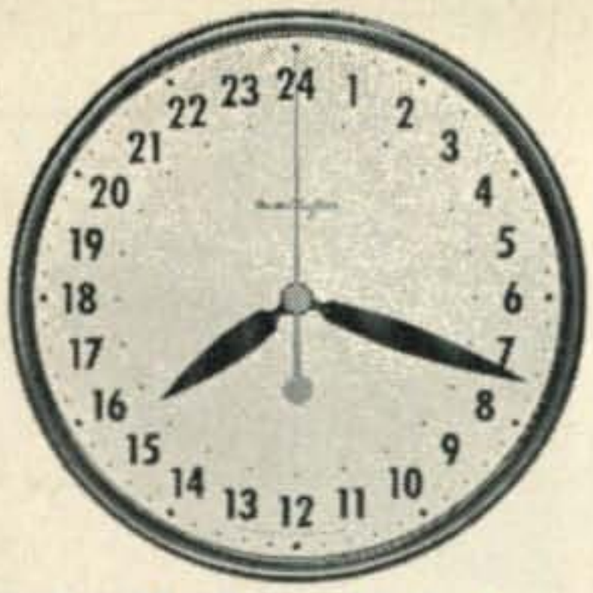
24 HOUR CLOCK



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Wonderful addition to any "Ham" Shack—provides accurate time reading without confusion. Dependable, self-starting U.L. Approved electric movement. 13½" black case, 12" white dial, black hands and numerals with red sweep second hand. Operates on 115 volts AC, 60 cycles.

ORDER TODAY Only $14.95

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LEARN CODE THE MODERN ATKO WAY

Literature Available

Model A complete as illustrated. $49.50

Model B identical to model A except contains no tone source or speaker. $39.50

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For further information, check number 34, on page 110

"HOW TO MAKE MONEY IN Mobile Radio Maintenance"

AUTHORITATIVE GUIDEBOOK ABOUT THE BOOM IN TWO-WAY MOBILE-RADIO. GIVES FACTS, FIGURES, PAY RATES. WRITE TODAY! FREE

LAMPKIN LABORATORIES, INC. Electronic Div. BRADENTON, FLA.

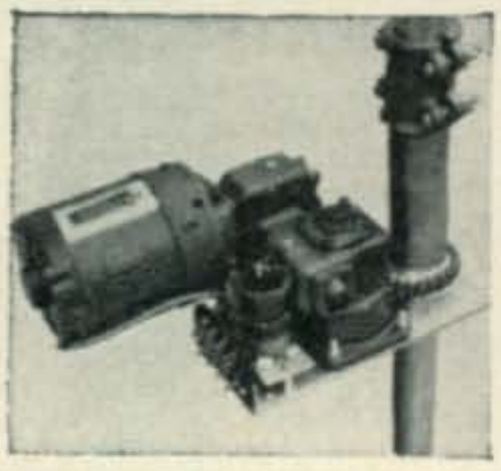
DX [*from page 104*]

PJ2AA	via, Hammarlund, GPO 7388, New York, N.Y.
PJ5CI	via WB2FSW.
PY7BAL/Ø	Box 842, Recife, Brazil.
SVØWGG	via K1EAT.
SVØWPP	via W5EGR.
ex-T2AU	now W8HMI.
ex-T2AU/5U7	now W8HMI.
VK9GC	Box 53, Rabaul, New Britain, Territory of New Guinea.
VK9JK	via W2CTN.
VK9TG	via W2CTN.
VP1WH	via W6SHC.
VP2KL	via Hammarlund, GPO 7388, New York, N.Y.
VP2LS	Box 171, Castries, St. Lucia, W.I.
VP2SK	via W3AZD.
VP2SM	via W3AZD.
VP6WR	via WB2FSW.
VR2ET	via VK6RU.
VS9ARO	via ISWL.
VS9OSC	c/o RAF Salalah, BFPO 69, Muscat, Oman.
VS9PCZ	via RSGB.
VU2DIA	B. S. Hedge, ATMO, Inter Police Wireless, Port Blair, Andaman Islands, India.
W5HWR/VP9	via W5HWR.
W9FKL/KJ6	APO, San Francisco, Calif. 96395.
XW8AY	Ocie O. Sager, USAID, APO 96352, San Francisco, Calif.
XW8AZ	Box 402, Vientiane, Laos.
YA1YL	via W2CTN.
YA2FMH	via WB2CXY.
YV5BIG/YV7	via K3SLP.
ZD9BB	via ZS6SI.
ZD8CI	via K4SCO.
ZD8DX	via WA4KCV.
ZD8HL	via W2CTN.
ZD8JC	via W5EBJ.
ZD8JL	via WA4INR.
ZD8TV	via G3SNN.
ZD8WR	c/o Western Electric, Box 4187, Patrick AFB, Fla.
ZL3VB	via ZL2GX.
4X4BL	via OA4OS.
4X4HW	via K4WMB.
4X4RD	via W3HNK.
4X4UH	via W3HNK.
5A3TX	via W3HNK.
5N2JEB	Box 914, Lagos, Nigeria.
5R8AN	via W3KVQ.
5U7AG	Box 201, Niamey, Niger Republic.
5V8AB	Box 123, Lome, Rep. of Togo.
5W1AZ	George W. Ashton, Faleolo Airport, Apia, W. Samoa.
5X5IU	Box 61, Mbale, Uganda.
ex-601AU	now W8HMI.
9M2	QSL Bureau, Box 777, Kuala Lumpur, Malaya.
9M4, 9M6, 9M8	QSL Bureau, Box 777, Singapore.
9M4LP	via ISWL.
9M4MB	via K7GCM.
9M6LX	via WA2WUV.
9M8EB	via VE3DFU.
9M8KZ	via G3KZM.

RTTY [*from page 89*]

8 P.M. (EDT) around 3620 kc. WB2CTU of Syracuse, N.Y., is on 80. WA2TDG of Owego, NY., has a CV-357A TU and needs an instruction book. *(Try Propagation Products Co., Box*

TELREX ROTATOR-INDICATOR SYSTEM MODEL TS250-RIS



Mast Feeds Thru Rotator For Safe, Easier, Installation

- 1300 IN/LBS ROTATION TORQUE
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- WILL FIT INTO OR ONTO A 6" SIDED TOWER

A Really Sturdy ROTATOR-INDICATOR SYSTEM— NOT a Modified TV Rotator! Designed To Out-Perform, Outlast!

$250.00 F.O.B.

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TS435-RIS $435
TS535-RIS $535
TS585-RIS $585

Write for FREE PL65 Describing Rotators and Antennas

TELREX LABS. ASBURY PARK, N.J.

For further information, check number 35, on page 110

242, Jacksonville 1, Florida, Tom.) W2QFR of New Rochelle, N.Y., has a Model 26 for sale, with auto carriage return and line feed. (!)

W3ZIV of Stroudsburg, Pa., is on 80. WA4-IWE of Pilot Mountain, N.C., is on 20 as is W5VQK who is /4 at Fort Bragg, N.C. W5JWP of Hearne and K5PJB of Comanche, both in Texas, work 20 meters. W5ATK of Amarillo, also in Texas, has a CV-89 (from the AN/URA-8A) TU, an ARC-1 for 2 meters, and an AN/VRC-32 for 6-meters.

W8SDB of Lansing, Mich., uses a W2PAT converter with an RME-6900 receiver. K8CKD of Ludington, Mich., uses a DX-100, an SX-101, and a W4TJU converter with his Model 19 and Model 14 typing reperforator, mostly on 80 but sometimes on 20. W8UUS of Kalamazoo, Mich., uses a W2JAV tube-type TU. W8WNO of Cleveland, Ohio (and West Virginia), now has a Model 26. W8MUK of Toledo, Ohio, uses a "real old" Model 26 with his S-line and a W8SDZ converter on 80 meters.

K9QNV of Grayslake, Ill., uses 500-watts on 80 at night and works DX on 20 in the daytime. W9IUV of Chicago, Ill., is on 80 as is W9OKF/9, who uses a Model 19. WØRQI of Denver, Colorado, works 20 meters.

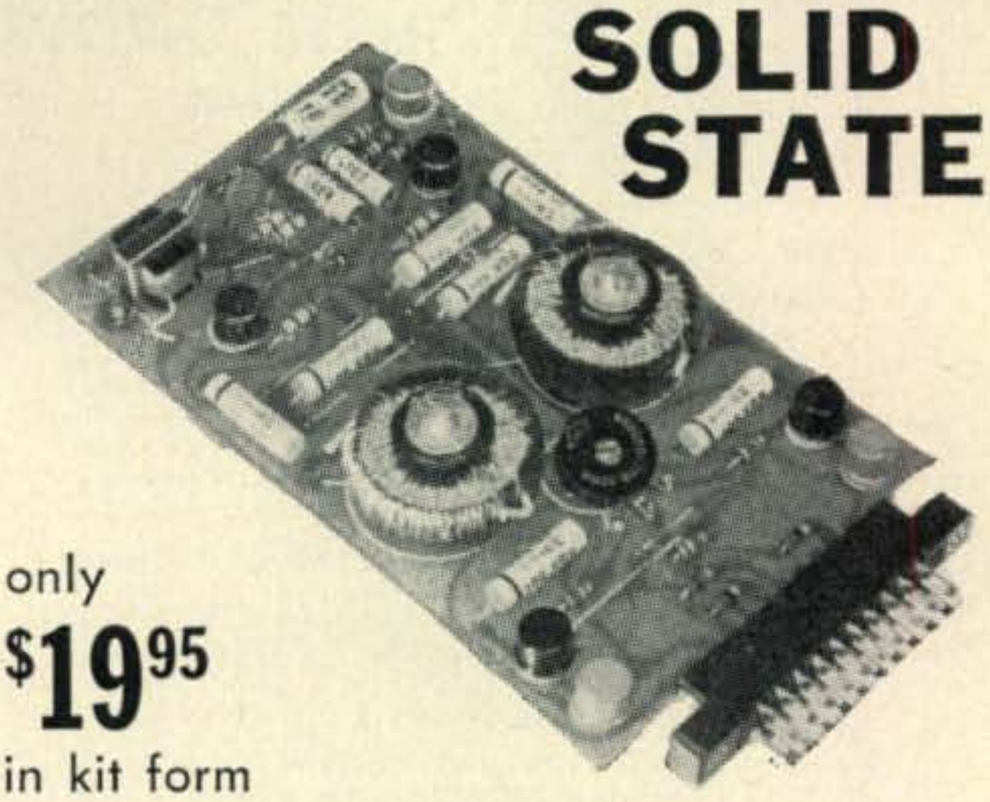
PZ1AX of Surinam is on 20, nicely covering the east coast of U.S. WØITU is /F, patiently (?) waiting for reciprocal licensing, but copying with a Model 15 with a governed motor on 50 cycles. He needs gears to use a 60-cycle synchronous motor, namely #84064 with #84065 for 50 baud (66 w.p.m.) and #74192 with #74193 for 45.45 baud (60 w.p.m.). If you can help, contact James R. DonCarlos. DCA-Europe, Code E316, APO New York, N.Y. 09163. ILORS makes good use of his TT63 regen repeater, thanks to K8JTT who sent him the technical information he needed to get it going. VE3DTY of Port Credit, Ontario, uses 125 watts on 80 meters. SM2DWJ is looking for 88 mhy loading coils for a W2JAV transistor TU. *(Try W6VPC, 1067 Mandana Blvd., Oakland 10, California.)*

Comments

Official ARRL Bulletins sent by W1AW on RTTY are now close to being a reality. Because of the approximate two month lag in the time between when we write these words and the time you read them in *CQ*, we sincerely hope that W1AW will actually be transmitting Bulletins by the time this appears in print. Both Ed Handy W1BDI, Communications Manager, and Technical Director George Grammer W1DF, are to be congratulated for their efforts in this modernization of W1AW. 73, Byron, W2JTP

NEW... from ELECTRONIC SURPLUS SALES

W2JAV Converter SOLID STATE



only **$19.95** in kit form

Now a solid state W2JAV-type demodulator can be yours for as little as $19.95 in kit form (including all parts, pre-tuned filters and full instructions). Input impedance: 600 ohms. Reliable operation with as little as 50 millivolts input. Full signal current: 40 ma; no signal current: less than 5 ma. Measures only 3" by 5". Board only—$2.95. Complete Kit—$19.95. Factory assembled (tested and guaranteed)—$29.95.

ELECTRONIC SURPLUS SALES

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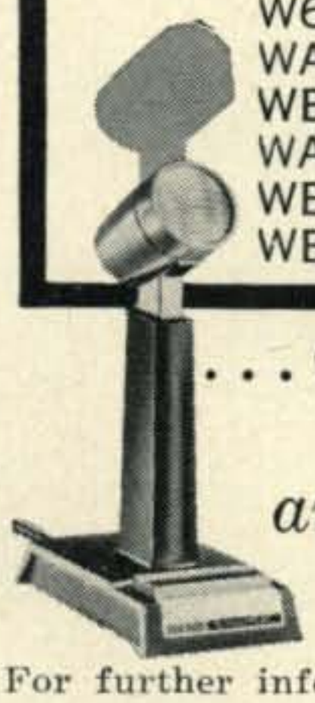
For further information, check number 36, on page 110

THESE OM'S HAVE RECENTLY SWITCHED TO A

SHURE 444 MIC

!1ZAQ	W8MWG
W2RHE	W9CBT
WB2LKB	WA9JIQ
F5JA	WA1IWV
WA5KSB	WB2IHT
W6NDY	KØDYO
WA6UMP	WØYQ
WB6IRJ	WAØFVR
WA8MOU	WAØGTD
WB2OJH	WAØIPB
WB6AJH	



. . . notice their improvement in intelligibility and added punch?

Shure Brothers, Inc.,
222 Hartrey Avenue, Evanston, Ill.

For further information, check number 37, on page 110

telrex **"BALUN" FED INVERTED "V" ANTENNA KITS**

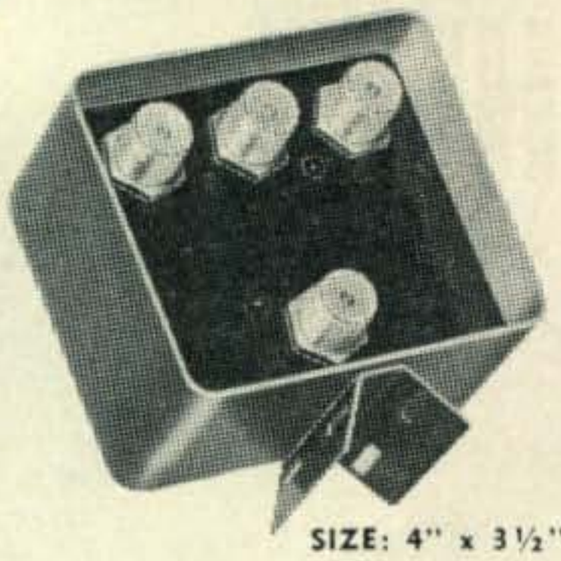
SIMPLE-TO-INSTALL, HI-PERFORMANCE ANTENNA SYSTEMS:

1 KW P.E.P. Mono-Band Kit . . . 1KMB1V/81K . . . $19.95*
2 KW P.E.P. Mono-Band Kit . . . 2KMB1V/81K . . . $24.95*

*Kit comprises, encapsulated, "Balun," copperweld, insulators, plus installation and adjustment instructions for any Mono-band 80 thru 10 Meters. Also available 2, 3, 4, 5 Band Models.

TELREX LABORATORIES
ASBURY PARK, NEW JERSEY

For further information, check number 38, on page 110



DOW-KEY DK72

SINGLE POLE THREE THROW COAXIAL SWITCH

SIZE: 4" x 3½" x 2⅝"; Wt.: 1 lb., 8 oz.

Weatherproof coaxial relay for remote switching of r.f. sources. Mounts on mast with remote switching up to 3 antennas. Not a rotating or stepping switch, but the common connector can be switched from any of 3 positions directly to any other 3 positions. Also may be operated so that any multiples of the 3 positions may be connected simultaneously to connector. Simple installation, save money by running one cable instead of several to your antenna array.

SPECIFICATIONS — 0 to 500 mc; power rating r.f. contacts (cold switching) — 1 kw; VSWR — less than 1.1:1 at 100 mc; Isolation — greater than 40 db at 100 mc; Life expectancy — over 1 million operations; Duty — continuous: 50 ohm impedence.

COIL VOLTAGES — 6, 12, 24, 28, 32, 48, 110 and 220 D.C. and 50-60 cps A.C. (Additional charge of $2.70 for 110 and 220 VDC.) Recommended voltages for exterior installations are 6, 12, 24, 28 v DC or AC.

MOUNTING — Supplied with bracket that accommodates 2 standard TV mounting straps for easy installing on antenna mast.

MODEL DK72 with UHF Connectors ——— $22.95

Available with type N, BNC or TNC coaxial connectors at $26.95.

Available in 72 ohm impedence in type UHF or N, $1.50 additional.

Please specify coil voltage and type connectors other than UHF.

For complete Coaxial Relay Catalog write:

DOW-KEY CO., Thief River Falls, Minn.

For further information, check number 51, on page 110

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CITY _____

STATE _____ ZIP CODE _____

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37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77			Total Inquiries				

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Port Washington, L. I., N. Y. 11050

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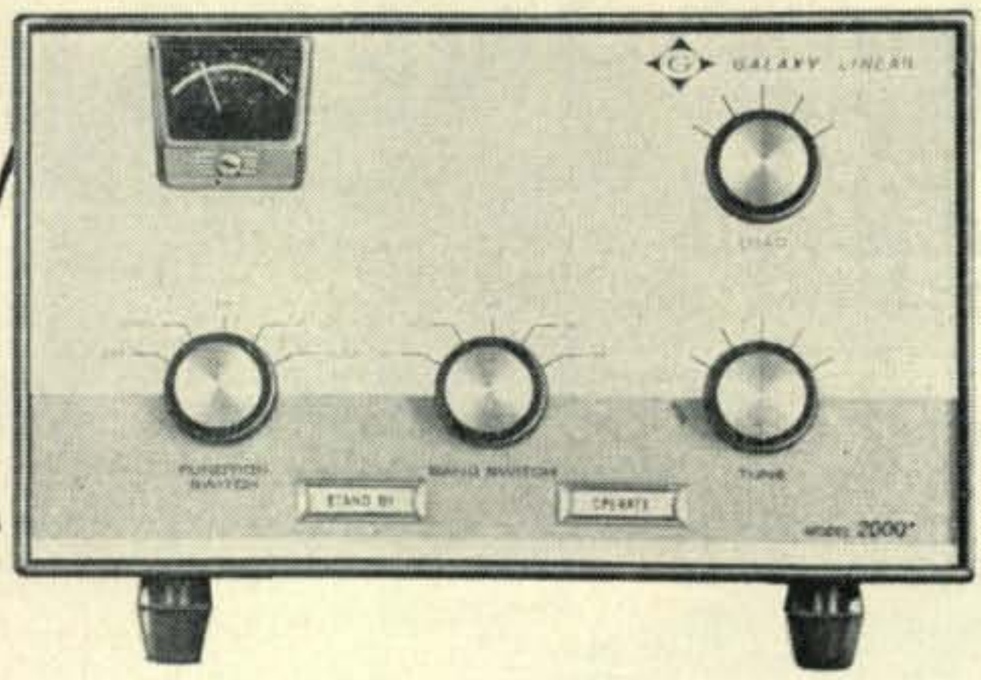
BREAK THROUGH



$450.00 Includes Separate POWER SUPPLY

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2KW+ TABLE TOP LINEAR FOR UNDER $500.00

GUARANTEED! 2KW+ PEP SSB INPUT and *1200 WATTS PEP OUTPUT*, ALL BANDS 80 THROUGH 10 METERS.

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For further information, check number 30, on page 110

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- FIVE Bands, 80 thru 10. (10 and 15 DX is starting into FB sun-spot cycle!)
- Full 200 Watt input on CW and SSB, 50 Watt AM.
- VOX, CW break-in, and PTT included.
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- Amplified ALC.
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For only $120 extra, we will include a brand new Hallicrafters HA-6 TRANSVERTER and matching P-26 pack. (Original Ham net price $449.00!)

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It also converts the received 6 meter signal to 10 meter input to your receiver.

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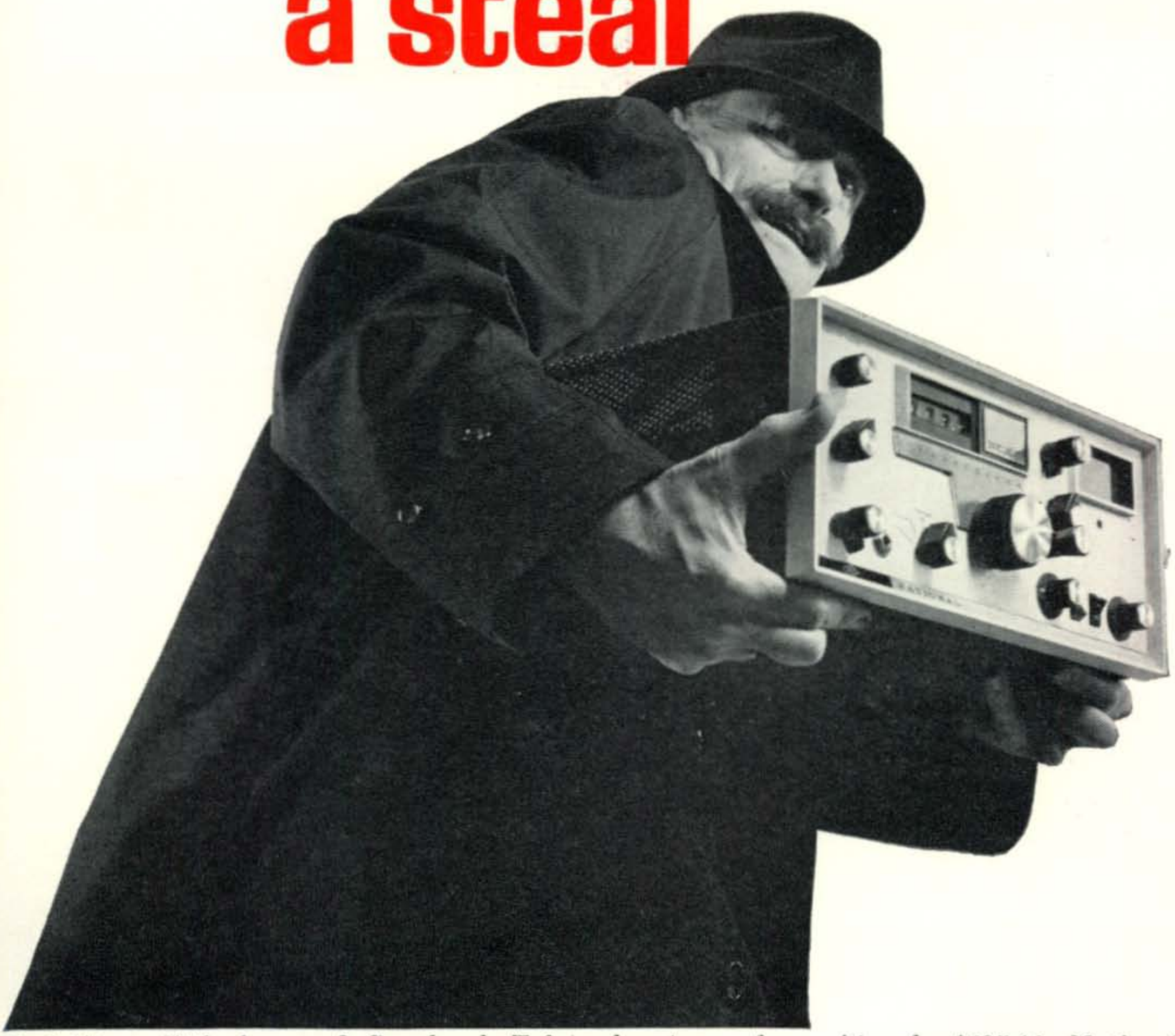
a steal



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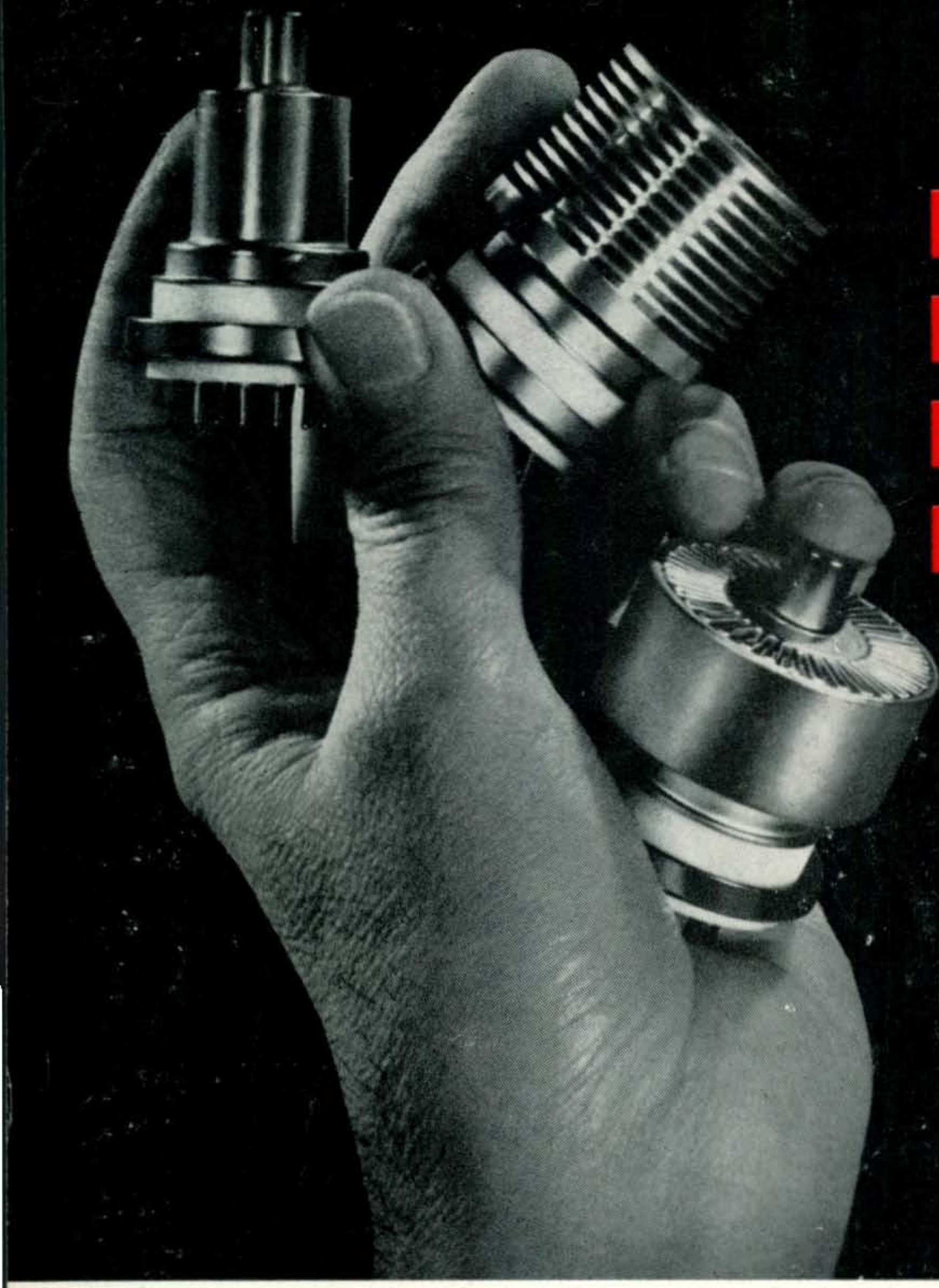

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Class C Telegraphy or RF Telephony Service

Type	Cooling	Maximum Plate Dissipation (watts)	Plate Voltage (volts)	Frequency (Mc)	Us Po Ou (wa
8072	Conduction	100*	700	50 175 470	1 1
8121	Forced-air	150	1500	50 470	2 2
8122	Forced-air	400	2000	50 470	3 3
8462 (Quick-heating)	Conduction	100*	700	50 175 470	1 1

*May be higher, depending on heat-sink design

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